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FORESTRY

VETERINARY MEDICINE

JUNE CONTENTS 1947

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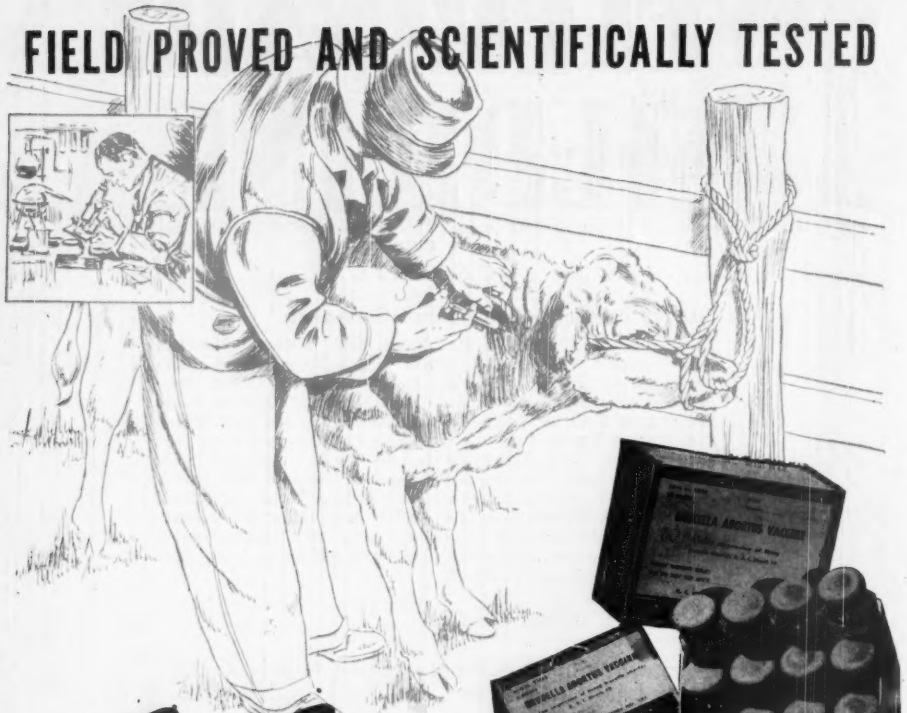

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D. M. CAMPBELL, *Editor*
7632 S. Crandon Ave., Chicago 49, Ill.
Telephone South Shore 7160

H. J. MOSTYN, *Eastern Representative*
P. O. Box 391, Dover, New Jersey
Telephone Dover 6-2711W.

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Estimates by the American Foundation of Animal Health place the percentage of droves of swine infected with brucellosis in the United States at 20%.

Some diseases are given medical names which define their nature. Others are called after the man who was first to write about a certain malady (eponyms), an unsatisfactory arrangement since the label gives no clew to the nature of the disorder.—*Theodore R. Van Dellen, M.D.*

In addition to being spread by contact and association, some diseases of poultry are transmitted from parent to offspring through the egg. Included are, (1) pullorum disease, (2) fowl typhoid, and (3) the leucemia complex. Obviously sanitation, however good, will not prevent the introduction of such diseases into the flock; eggs only from uninfected parents must be used for hatching if the poultryman is to avoid it.

The wide distribution of psittacosis-like infections throughout the animal kingdom has been established. Since 1931, one member after another has been indicted: latent infections were found in the parakeet-breeding establishments of the United States, Canada and European countries; the psittacine birds in Australia; the fulmar petrels of the Faroe Islands and Iceland (1939); and in the wild and caged pigeon population of the United States (1942); Great Britain (1943), and South Africa (1940). Canaries, finches, chickens, sea gulls and Peking ducks, also, were found to be infected.—KARL F. MEYER.

In an experiment in India by Minett, stableflies, houseflies, blow flies and carrion flies all were shown to be capable of transmitting anthrax to cattle and goats.

A campaign for the elimination of ox-warble flies from Cyprus was begun in 1938. In the season of 1943-44 only 15 infested cattle could be found on the island.

In the section of the United States west of the 100th Meridian, there are 66 genera and 232 species of fleas; east of that Meridian, there are 33 genera and 55 species.

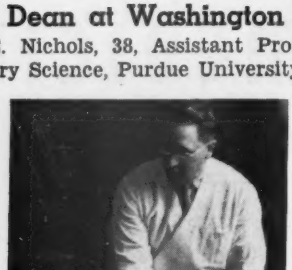
Dragonflies consume large numbers of stableflies, *Stomoxys calcitrans*. Where the former are plentiful they constitute an important check upon the increase in number of this annoying pest of animals.

Diets for working and racing dogs have been little studied. How should a dog be fed for a long day of hunting in contrast to a day of rest? How should the racing dog be fed for optimum performance? Answers to these questions may provide basic knowledge for athletes and soldiers.—*C. M. McCay* in *Natl. Prov.*

It is expected that there will be more than 2700 vacancies in the Medical Department of the Regular Army when pending legislation is enacted; 10 in the Veterinary Corps, 1900 in the Medical Corps, 370 in the Dental Corps, and 440 in the Medical Service Corps. In addition several thousand reserve officers on active duty, in the Medical Department, will be required for the interim army.

New Dean at Washington State

Roy E. Nichols, 38, Assistant Professor of Veterinary Science, Purdue University, Lafayette, Ind., resigned May 1st to accept the position of dean of the College of Veterinary Medicine, Washington State College, Pullman, Wash. Doctor Nichols was graduated from the Ontario Veterinary College in 1933. He was in charge of the small animal clinic at Ohio State University seven years, before going to Purdue, and was in military service three years during the late war.



Doctor Nichols demonstrating construction and application of modified Thomas splint for reduction of fracture at Purdue University Short Course, October, 1941

Dean Wegner Retires

Earl E. Wegner, retired from the position of dean of the College of Veterinary Medicine, Washington State College and relinquished administrative duties May 1, 1947. He will head the Department of Surgery in the College and, in addition, carry on research in which he has long been interested.

E. E. Wegner

Dean Wegner has long been on the faculty of Washington State from which he was graduated in 1908. He was appointed dean to succeed the late S. B. Nelson in 1918 and thus has served in that capacity nearly 30 years.

Haring New Dean in California

The appointment of Dr. C. M. Haring to the office of dean of the new veterinary college at the University of California has been announced.

Doctor Haring joined the faculty of the University and the staff of the California Agricultural Experiment Station, immediately after graduation at the New York State Veterinary College at Cornell University in 1904. Since 1912 he has been head of the Department of Veterinary Science in the University.

C. M. Haring

In 1915-16 Doctor Haring was secretary of the A.V.M.A. During World War I he served in the Veterinary Corps of the Army. From 1920 to 1924 he was Director of the Agricultural Experiment Station. During the late war he was consultant to the War Manpower Commission. One year of sabbatical leave (1924) was spent in graduate study in Switzerland. Since 1928 he has been consultant to the California State Board of Health.

During his long tenure on the staff of the California experiment station Dean Haring's achievements in animal disease research have been outstanding. His research on bovine brucellosis has been particularly noteworthy. For a decade he has been years ahead of other research in that field. Since the retirement of Cotton the best work of others on brucellosis has been confirmation of the work of Haring and Traum.

The School of Veterinary Medicine, University of California, will be located on the Davis Campus. It was authorized and a liberal appropriation for the necessary buildings was made before the war, but building was suspended for the duration. The short supply of building materials and of labor has caused further postponement. It is expected classes will be enrolled for the school year beginning in September, 1949.

Treatment of Mange in Rabbits

Dimethyl thalate, which ordinarily is used as a repellant for some species of mosquitoes, fleas and mites,[31] has proved successful in the treatment of mange in rabbits caused by *notoedres cati* var. *cuniculi*.

Bacitracin, one of the newest of the antibiotic agents is reported to have cured 62 of 100 cases, chiefly abscesses which, under other treatment, would have required surgical intervention. Bacitracin is as yet available for experimental use only.

The gelatin sponge is a hemostatic agent, useful in instances where ligatures, sutures or bandages are inapplicable, such as hemorrhage within body cavities. It possesses the capacity to adhere to bleeding surfaces and of being absorbed by the tissues in about five weeks.

Accidental Discovery

For many years phenolphthalin was used solely as a chemical indicator which turns red in the presence of an alkali but remains colorless in acid substances. The Hungarian government ordered that phenolphthalin should be added to all white wines as an aid in the detection of adulteration; and thereby hangs a tale—*a cathartic was discovered!*

Advancement of Science Evaluated

The advancement of science may be regarded from three points of view: (1) extending scientific knowledge; which is the province of research; (2) extending scientific knowledge to a greater number of persons; which is the province of education and educational institutions and (3) extending the use of scientific knowledge which is the province of industry, agriculture, the artisans and professions.

Capacitron is the name given a new electronic device by which electrons can be released for a period of a millionth of a second. According to the inventors it may be used for sterilizing all manner of substances—hypodermic and intravenous solutions, whole blood, plasma, milk and other food without affecting the potency, taste or other characteristics. A longer exposure to the shower of electrons—15 millionths of a second—will preserve foods by inhibiting enzyme as well as bacterial action. An "irradiated" beefsteak was unchanged after 12 days in an incubator at 98° F.

[31] Osborne, H. G. *Australian Vet. J.*, 23:2, p. 52. 1947.

Insect Secretions Valuable

Eighty medical products originally discovered in the secretions of insects are now prepared synthetically for use in the treatment of indolent wounds. Ammonium allantoinate, among the newer and more popular of these agents was discovered in the secretions of fly maggots.

The March allocation of streptomycin to the Veterans Administration was practically four times as much as was allocated to it in October.

The March allotment (28,500gm) of the V.A. was about one fifteenth of the full amount allocated that month by the Civilian Production Administration.

Curare has been used in the form of intercostrin to treat patients undergoing shock treatment for psychoses. However, cyanosis and respiratory difficulties are greater than in treatment without curare. Therefore neostigmine should be used to neutralize the curare when the convulsions have subsided. Then there appears to be less fear of shock treatments by the patient when curare is used.

Another Antibiotic

A chemical, SD-17, from a mold found in the soil of a cattle inclosure where brucellosis infected cattle were kept, has been found capable of checking *Brucella abortus* organism in test tubes, by a bacteriologist of the University of Chicago. The mold when grown on an artificial media is tan on one side and brown on the reverse side. SD-17 was used in dilutions of 1 to 64,000. Further tests as to its use in brucellosis in man and animals are to be made.

BAL (British antilewisite) is a product of wartime research, which was developed to combat the injuries of the warfare gas lewisite. It is finding a peace-time use as an antidote for mercury and arsenic poisoning. It has already been used with success in more than 200 cases of arsenical poisoning in man. It is reported to be useful also in lead and cadmium poisoning. Preparations are available for topical, oral and intravenous use.

A new use for this anti-lewisite drug has been discovered. It is an effective antidote for gold salts poisoning which may occur in the treatment of rheumatoid arthritis, report physicians at the Philadelphia General Hospital. Others have tested Bal for the affection and found it quite effectual. Bal has been used as an antidote for arsenic poisoning for some time.

Army Veterinary Officer Retires

Horace S. Eakins, Colonel V.C., was retired from the active list of the Army 31 Jan., 1947 on his own application. Colonel Eakins was

Colonel Horace S. Eakins

born in Colorado and was graduated from the Division of Veterinary Medicine, Colorado State College, D.V.M. in 1911, M.S. in 1921. For a time he served on the faculty. He entered the National Army as a second lieutenant in August 1917 and the Regular Army as a captain in 1920, and was promoted through the grades to Colonel 10 Sept., 1939.

Following World War I Colonel Eakins, then a captain, was instructor at the army veterinary School of Meat and Dairy Hygiene and Forage Inspection at Chicago, 1920-23 and after the school was moved to Washington to become the Army Veterinary School, he was the first Director 1923-24. In 1924 he published a text on Military Meat Hygiene which is still the official army text on meat inspection.

Colonel Eakins served in many posts through the United States, including a tour of duty in the Office of the Surgeon General, 1919-20 and two tours in the Panama Canal Department, 1925-28 and 1931-35. At the beginning of World War II he was Corp Area Veterinarian Hq. Third Corps Area, Baltimore 1939-42. His last tour of duty, August 1946 to retirement, was as Chief of the Military Ground Mission to the Panama Republic. For this, he received the Army Commendation Ribbon.

* * * *

Dr. W. A. Boney, Texas Agricultural Experiment Station, reports finding the causative agent of fowl typhoid, *Shigella gallinarum* in a turkey egg. Fowl typhoid has long been suspected of being transmitted through the egg but infected eggs have not heretofore been found.

The Livestock Research Foundation has been incorporated to conduct research in the field of livestock pathology. Dr. W. W. Dimock is scientific director of the foundation. The office and laboratory are in Louisville, Ky.

* * * *

Foot and Mouth Disease in Mexico

The North American continent has been fortunate in that few outbreaks of foot-and-mouth disease have been experienced. Recently, however, the disease has broken out in Mexico on an alarming scale and, even if eradicated, will cost that country a tremendous sum of money. In this Journal from time to time has been pointed out the hazards which the increased tempo of transportation introduces in relation to the spread of animal plagues. Although we may be far removed from an infected area, the modern rate of travel is such that only a few hours of travel intervene. This obviously makes any outbreak in North America of great importance to Canada.

The United States is taking exceedingly active measures to prevent the introduction of the disease into that country and to give assistance to the people of Mexico, in this perilous time. We have reason to be thankful that the Government of the United States within comparatively recent months had the wisdom to re-unite its divided veterinary services and to place the reconsolidated Bureau of Animal Industry under the control of a distinguished veterinary scientist who is an able administrator. This intelligent move was made in the nick of time and Canadians may be exceedingly grateful as it offers one of the best protections against foot-and-mouth disease invading the United States and consequently being brought into close proximity to Canada.

The information which is available regarding the manner in which the disease found its way into Mexico is somewhat scanty but demonstrates definitely that the responsibility for the welfare of a country where animal diseases are concerned should not be left in the hands of laymen but made the responsibility of those who are trained veterinarians. Although there is a treaty between the United States and Mexico in which the two countries made a covenant to introduce no ruminants or swine from countries where foot-and-mouth disease is present, Zebu bulls were introduced into Mexico from Brazil, where the disease exists, held in quarantine on an island for a time and finally transferred to the mainland. In spite of a protest from the United States authorities, a second shipment followed and from this source foot-and-mouth disease appears to have been introduced into Mexico. The number of animals which are said to have been included in the two shipments do not number 500 and the tremendous price which must be paid for the violation of the simple principles on which are based the protection of a country against great plagues should carry with it a warning to others who may be tempted to flirt with this or other infections. It also carries with it in a very emphatic manner a warning that allowing laymen to direct or control veterinary problems is courting disaster and is diametrically opposed to the best interests of the country.—Editorial in the *Canadian J. of Comparative Medicine and Veterinary Science*. February, 1947.

The Omsk Veterinary Institute, Moscow, U.S.S.R. maintains a chair of reindeer breeding. For 25 years the Institute has given much attention to the study of the diseases, breeding, feeding and care of the reindeer.

Examination of 146 pigeons captured in three Ontario cities for the presence of ornithosis infection discovered 24 (16.4%) to be seropositive when tested with psittacosis antigen. A virus indistinguishable from the virus of psittacosis was isolated from 58% of the reactors.

Trypanosomiasis in Indian Cattle

Bovine trypanosomiasis has assumed paramount importance amongst livestock diseases in India. Fatal forms of this disease have appeared in cattle now and again associated with symptoms and a mortality almost comparable to those observed in the equine species. The circumstances under which the causal parasite (tentatively identified as *Trypanosoma evansi*), which is normally harmless for cattle, becomes so markedly virulent is unknown.—G. R. Viswanathan, in *The Indian Veterinary Journal*.

African Cattle Louse Discovered in U. S.

A serious cattle louse problem has been discovered in Florida by entomologists of the USDA. Heavy infestations of these lice sap cattle of their vitality rapidly and are said to cause some to become too feeble to walk.

The louse is one previously known to occur only in the vicinity of Kameruns, West Africa, where it was first discovered in 1915. It has not been reported since. How it got to the United States is unknown. Entomologists of the Bureau of Entomology and Plant Quarantine first discovered it in Florida in 1945, more recently it has been reported from Texas. It has spread to a number of counties in south and central Florida and is now known to occur as far north as Duval County, near the Florida-Georgia state line.

These lice infest the brush of the tail of cattle. Cattlemen call it the "tail louse." The eggs are glued to the long hairs of the tail. When cattle are heavily infested the tail has a matted appearance.

Sprays containing 1.5% DDT in a wettable powder form have been found to free cattle of this parasite. Less DDT in sprays will not give effective results. Although the tail is mainly infested, the entire animal should be sprayed thoroughly. One and one-half to two pints of the spray per animal is sufficient.

Livestock in the Anglo-Egyptian Sudan are reported to number three million cattle, six million sheep, five million goats and one million camels. Nearly all are owned by nomads.

Argentina has undertaken the eradication of parasitic mange from sheep and goats. In 1942 it was estimated that more than 50 million sheep and three million goats were affected. Eradication measures instituted in the southern provinces were so successful that a decree was promulgated instituting compulsory eradication measures for the whole country.

To Study Effectiveness of BCG Vaccine

Following upon reports presented at a recent conference of tuberculosis leaders of the United States, China, and Denmark, the U. S. Public Health Service announced an extension of its tuberculosis research program to include studies on the effectiveness of BCG vaccine in preventing the disease.

Bovine Tuberculosis in Britain

The following questions and answers in Parliament are reported by *The Veterinary Record*. They again emphasize the importance to the public health of bovine tuberculosis control in this country—a veterinary achievement.

Mr. Granville Sharp asked the Minister of Health what approximate percentage of human tuberculosis is attributable to bovine infection; how many deaths occurred from this cause during each of the last five years of which records are available; what powers he has to protect the public from this source of infection; and when he proposes using them to the full.

Mr. Bevan: It is estimated that bovine infection causes less than 2% of pulmonary cases, 30% of non-pulmonary cases, and 6% of all tuberculosis death in England and Wales. No powers at present exist to prevent the sale of tuberculous milk until the infected cow is discovered, but the question is under review by the Department now considering revised Milk and Dairies Regulations.

Mr. Sharp: Can the Minister say how long this matter has been under review and when a decision may be expected?

Mr. Bevan: Very shortly, I hope. It has been under consideration for some time, but it is a complicated matter.

Mr. Somerville Hastings: Is not the Hon. Gentleman aware that most of these deaths could be prevented by the pasteurization of milk?

LAST CLASS (1941) OF COLLEGE OF VETERINARY SCIENCE, UNIVERSITY OF THE PHILIPPINES, GRADUATED BEFORE PEARL HARBOR

Faculty members shown are: 1. Dr. Amado E. Baladad, 2. Dr. Lope M. Yutue, 3. Dr. A. K. Gomez; 4. Dr. Arcadio C. Gonzago, and 5. Dr. Faustino S. Mensalvas

Veterinary College Needs Textbooks

As many of our readers know, the University of the Philippines was used by the Japs as a military post during the occupation of Manila and was burned just before the liberation. The buildings of the veterinary college with the scientific library and records were destroyed.

One of the severe handicaps encountered on the resumption of teaching in the veterinary school was lack of textbooks and reference works. Many American veterinarians have long taken a keen interest in the Philippine veterinary college and will sympathize with the faculty in its present difficulties.

These handicaps are infinitely multiplied by the impoverishment of all departments of the government of the new Republic—industry, agriculture and commerce having been destroyed by the invader as was to a large extent tangible property and the lives of thousands of its citizens. Under the circumstances, many veterinarians in this country may wish to donate some part of their libraries to the struggling school. Any veterinary works will be welcomed by the school library. Donations need not be of the latest editions, but, naturally, the later the editions the more useful the works. The books should be sent to:

The Philippine Embassy,
1617 Massachusetts Ave.,
Washington 6, D. C.

They should bear the inscription:

For Library, of the College of Veterinary Science, Manila, Philippine Islands.

Postage on books is three cents per pound, plus 3%, *i.e.*, 25 pounds, 77 cents; 50 pounds, $1.55; and 70 pounds (weight limit) $2.16.

Seymour Hadwen Dies

Dr. I. Seymour Andrew Hadwen, 61, died at his home in Toronto April 18. He had been in poor health since suffering an apoplectic stroke three years ago.

Doctor Hadwen was the last survivor of a group of Canadian pioneers in animal disease control. Although much younger than the others his professional association began with Rutherford, Torrance and Watson. Born in Liverpool, Doctor Hadwen received his early education in England and France. He was graduated from the Veterinary School of Magill University in 1902 and later pursued graduate studies in research at Cambridge and Liverpool universities. He served with Canadian Mounted Rifles in the South African War.

Research over a wide field claimed Doctor Hadwen's attention from his return from South Africa to his retirement 10 years ago. Positions held by him included: Veterinary inspector with the Dominion Department of Agriculture, 1904-08 and Animal Pathologist, 1917-20; Professor in charge of the research laboratory, University of Saskatchewan, 1923-28; Director of the department of pathology and bacteriology, Ontario Research Foundation, 1928-37. In 1920-22 he was employed by the U. S. government in charge of reindeer investigations in Alaska.

Newer Insecticides and Rodenticides

Research during the war and since has developed a number of new insecticides, repellents, and rodenticides of outstanding value or promise.

Insecticides

DDT, discovered as a chemical in 1874 and as an insecticide 65 years later, has been most widely publicized. It is widely used in a variety of formulations including oil solutions, emulsions, powders and aerosols. The remarkable effectiveness and residual toxicity of DDT makes it possible to deal much more effectually than in the past with infestations of flies, mosquitoes, bedbugs, fleas, lice, cockroaches and similar pests.

DDD is a compound closely related to DDT, and appears to have comparable qualities as an insecticide.

Benzene hexachloride, 666 ($C_6H_6Cl_6$), also called gammexane and hexachlorocyclohexane, was first made by Michael Faraday about 120 years ago. Its value as an insecticide was discovered in England during the war. Its toxicity to insects is due to the gamma isomer (gamma-benzene hexachloride). It is more toxic than DDT to house flies and highly effective against lice, bedbugs, fleas, cockroaches, ticks, etc. Residual deposits are less persistent than with DDT. The crude products contain 10-12% of the gamma isomer and has a musty odor.

1068 ($C_{10}H_6Cl_8$) is a chlorinated hydrocarbon exceeding DDT in its toxicity to house flies and cockroaches. It is effective against lice and as a mosquito larvicide.

3956, a chlorinated bicyclic terpene, is indicated as of value against mosquito larvae, lice, and various species of household insects.

Benzyl benzoate in emulsions readily controls scabies and louse infestations.

Synergists for increasing the effectiveness of pyrethrum are isobutyl undecyclenamide, sesame oil, sesamin, piperonyl cyclohexanone and piperonyl butoxide.

Rodenticides

Two remarkably effective new compounds are alpha-naphthyl-thiourea (antu) and sodium fluoroacetate (1080).

Antu was discovered as a rat killer by Dr. Curt P. Richter. It is largely specific for the brown rat but is also poisonous to dogs. Death occurs from acute pulmonary edema and pleural effusion. Three or four milligrams will kill an adult rat. It is applied as a contact dust and in baits (2 to 3%).

Sodium fluoroacetate (1080) is extremely toxic to domestic and field rodents but also to man and other warm-blooded animals. It is used as a 0.4% water solution, and at a concentration of 0.2% in baits. Its application in the United States is confined to public health authorities and pest control operators. Its use is not yet permitted in Canada because of its dangerous toxicity, the practical impossibility of detecting its presence, and the lack of an antidote. Its action is primarily on the heart. —*Canadian J. Pub. Hlth.*

* * * *

A spray emulsion containing one ounce of DDT, five ounces of pine oil and 15 gallons of water was found to be effective against ticks for a period of 68 days.

* * * * *

Derris powder for combatting warbles, *Hypoderma lineata* and *H. bovis*, should contain at least 1% rotenone and should be so ground that 90% of it will pass through a 200-mesh sieve.

* * * *

DDT in Insect Control on Cattle*

Beef cattle should be sprayed with two quarts of 0.25% suspension of wettable DDT in water per animal, where a power sprayer (gauge set at 500 pounds) is used, or one quart of a 0.5% when a hand sprayer is employed. This affords protection from house flies, hornflies and stable flies for 10 days to three weeks. If they are sprayed on the underline as well as the back the protection lasts twice as long. Slight if any protection is afforded from attacks of heel flies and tabanids.

The spray should be directed perpendicular to the surface to be covered. Crowding the cattle into eight-foot alleys and directing the spray from catwalks along the sides is a convenient method of spraying beef cattle.

DDT spraying lends itself well to area fly control. When all animals and buildings in an area six miles square were sprayed practically all flies disappeared in the center of the area and screens were unnecessary on farm houses.

For lice, cattle should be sprayed, including the legs and underline, with 1% DDT spray. This will kill all lice on the animal and sufficient residual effect will remain to kill those that hatch from the eggs, which are not harmed by the spray.

In tests where sprayed cattle and unsprayed controls were kept under comparable conditions the number of hornflies averaged but five on sprayed animals but reached a density of 3000 per cow and 20,000 per bull on unsprayed animals.

One and one-half million cattle in Kansas were sprayed with DDT for fly control in the summer of 1946 and 795,000 were sprayed for grub and louse control in the following winter. Three hundred power sprayers were used.

*Gleaned from a report of the National Livestock Prevention Board, for 1946.

Flies literally eat up profits in the livestock business. They congregate on the animal where they can't be reached with either tail or nose. There is loss of gain by bunching together, fighting pests and failing to graze normally. Cattle lose nourishment through blood sucking parasites and acquire some diseases through them. Fly-free cattle fan out in the pasture and graze till they are full, then lie down contentedly and put on extra weight and bloom. Feeder steers that were sprayed with DDT put on up to one-half pound of gain per day more than comparable steers that were not sprayed. An extra gain of 125,000,000 pounds is a conservative estimate of the result of cattle spraying in just two states—Kansas and Oklahoma in 1946.—*From report of the National Livestock and Meat Board.*

Tuberculosis of Poultry and Swine

The National Livestock Loss Prevention Board publishes frequent reports showing the prevalence of avian tuberculosis in swine and poultry and includes with these reports comments intended to arouse interest in the prevention of this disease.

An assumption in these messages, that detracts from their effectiveness, is that swine acquire tuberculosis from chickens and if it were prevented in the farm flocks it would automatically disappear from the swine herds.

No one knows whether swine acquire the infection mainly from poultry, or poultry acquire it from swine, or whether neither possibility obtains. Certainly there is nothing in the Board's statistics to determine this matter one way or the other. The Board's assumption that chickens are the primary hosts of the avian tuberculosis organisms may be right, but assuredly it is hazardous to build the whole plan of control upon this assumption without at least reasonable evidence that it is sound. It is well to recall that one false assumption, as to the sole source of tuberculosis infection in swine, has already had wide acceptance—that swine contracted the disease from cattle. One wrong guess is enough.

The following may be cited, not to prove the National Livestock Loss Prevention Board wrong in its assumption but to indicate the need for caution until explanations of these matters have been developed.

1. Avian tuberculosis is prevalent in fowl only in the swine belt.

2. Tuberculosis testing of swine and poultry in the swine belt discloses a higher incidence of tuberculosis in swine than in poultry.

3. The number of farms on which the disease prevails in swine, but not in poultry, is approximately equal to the number on which the disease occurs in poultry but not in swine.

4. Swine contract the disease from a shorter period of exposure than do chickens.

5. "Avian" as a part of the name of the disease signifies only that the organism was first isolated from birds. Had the first isolation been from swine the disease would probably be called "porcine tuberculosis."

The Board's objective should be to eradicate tuberculosis from poultry *and* swine. When it is known that eradication in one species will free both, will be soon enough to restrict efforts.

Our livestock industry is paying a heavy penalty for not having an adequate veterinary service. The losses from preventable diseases and accidents add up to an enormous total each year. Good veterinary service could reduce this loss to a small percentage of its present volume.—*Ann. Rept. State Veterinarian North Dakota.*

Waste of Meat in Marketing

Records of the National Livestock Loss Prevention Board for 1946 indicate that despite all the effort of the past score of years to bring about more humane and less wasteful methods of marketing livestock, the loss of meat due to killing, crippling and bruising of animals between the feedlot and the abattoir aggregated, at least, 12 million dollars at wholesale prices; perhaps twice that amount at retail price levels. The Board places the pounds of meat lost at 13,270,000 for animals that arrive dead at the public markets, 19,270,000 for crippled and 8,000,000 for bruises.

Nearly all of this loss is preventable by good methods of handling. The bruising in the main results from kicking, clubbing, horns on cattle, unloading from upper decks without ramps, projections on the inside of cars or trucks and loading hogs under cattle; the crippling from hauling different species in the same car or truck without partition, calves with mature cattle, with no or insufficient bedding and unloading from upper decks without ramps. Dead animals result mainly from the same causes as cripples and from lack of care to prevent overheating.

The losses are higher in the transport of animals by truck than by rail; the percentage being approximately twice as great. The greatest damage in truck shipments was due to less than 25% of the haulers "who are quick tempered, lack experience and are by nature unadapted to this work."

In addition to the foregoing, of the 33,947 animals condemned on ante mortem inspection, a large percentage was due to injuries.

Parasitism in Feeder Lambs

D. F. EVELETH and ALICE I. GOLDSBY
Fargo, North Dakota

ON many midwest farms sheep raising is a secondary project. The lambs are born late in the spring and are raised on pasture without supplemental feeding. Frequently little or no effort is made to combat internal parasites of sheep on the small-flock farm. The lambs raised under such adverse conditions are often undersized and are not considered good risks by lamb feeders. Generally, such lambs are wintered on the farms, where they are forced to subsist on low-grade roughage, until pasture is available the following spring. When the pasture is needed for the next flock of lambs the older lambs are sold to feeders for feedlot fattening. Many feeders purchase these yearling lambs for summer feeding in order to supply lambs and yearlings to the packers before southern and western, grass-fat, weanling lambs are available.

There is considerable difference of opinion regarding the desirability or necessity of anthelmintic treatment for these yearling lambs, before starting them on heavy concentrate feeds. When there is clinical evidence of parasitism there is, of course, no doubt as to the necessity for an anthelmintic. However, many lambs entering feedlots show only an unthrifty appearance without other symptoms of parasitism.

In order to obtain information on the value of anthelmintic treatments given to yearlings or lambs entering feedlots the following trials were conducted.

The experimental lambs were selected from various sources as small lots were marketed at the local yards. Lambs that were not finished for satisfactory slaughter were used in the experimental lots. Eighteen lots, of 25 lambs each, were obtained by sorting an assembled flock of 450 lambs into groups as nearly equal as possible. There was some weight variation in the averages of the various lots but an attempt was made to compensate for this by the average of the grades. Each individual lamb was weighed, graded, and identified with an ear tag and a paint brand. The standard market grades were used, but in order to facilitate comparisons these grades have been assigned these numerical values, Cull, 1; C, 2; B, 3; A, 4; AA, 5.

The lambs were started on a low concentrate feed and gradually brought to full feed on the ration given in table I.

Salt was furnished in small boxes which were kept well filled. As described later some of the lots received an anthelmintic in the salt.

Water in concrete troughs was available at all times. The pens were in a large, roofed shed with concrete floors. Ample bedding was supplied to keep the pens dry. All groups were handled as nearly alike as possible except for the anthelmintic treatment.

At the termination of the feeding trials, all lambs were slaughtered and total ova and worm counts of the visceral content were made. The number of lambs showing nodules on the intestines, as well as the number of liver condemnations were also ascertained. The worm counts and ova counts were made by the method described in an earlier paper by Goldsby and Eveleth.[6] The nodules on the intestines were counted, unless more than 10 nodules were present. Liver inspections were made by the Veterinary Inspectors of the USDA Meat Inspection Service.

After the lambs had been divided into the various lots, fecal samples were collected and the ova were counted. The methods of treatment used are shown in table III.

The anthelmintic substances used in the treatments are described in table II. The method of administration and the total amount of active ingredients administered are summarized in table III.

Weights were also taken on each lamb a week after treatment. Weights and fecal ova counts were made at three-week intervals during the course of the feeding period.

The time interval during which different data were obtained varied from one to three days on various lots, but since they were on a constant feeding regime, the data have been reduced to a unit basis for comparison.

The lambs were slaughtered in two groups one of which was on full feed for 53 days while the other group was on full feed for 55 days. An attempt was made to keep the members of each treated group together, as the slaughtering proceeded. Each lamb was identified with two tags, one for the viscera; one for the carcass. The viscera of each lamb was packed in a separate box and frozen immediately. The chilled carcasses were then weighed as lots and graded but, through an error, the individual carcass grades were not obtained. One carcass was weighed with the wrong lot. One lamb (in Pen 3) was killed in extremis on the day of slaughter, which accounts for the differences in the number of lambs in tables IV and V.

The number of lambs finishing the feeding period, the amount of feed consumed per day,

[6] Published with the permission of the Director, North Dakota Agricultural Experiment Station, Fargo, North Dakota.

the amount of salt consumed per day, the initial grade, and grade difference as well as similar data for the weights are given in table IV. Also, in table IV, the daily gains in weight are summarized, the pounds of feed required per pound gain and the cost per pound gain as calculated from the prices given in table I.

The live weight taken by lots the evening before slaughter as well as the dressed, chilled weights, yield, and carcass classification of the various groups are given in table V.

The number of lambs having nodules on the intestines in the various lots is shown in table VI, while the number of liver condemnations by lots, is shown in table VII.

Many anthelmintics have an inhibiting effect on ova production in the nematodes. While this property of the anthelmintic is of little consequence in feedlot lambs it is of importance in the breeding flock. A summary of the number of lambs shedding ova of Haemonchus, Ostertagia and Trichostrongylus, at the beginning and at the end of the feeding period, is given in table VIII.

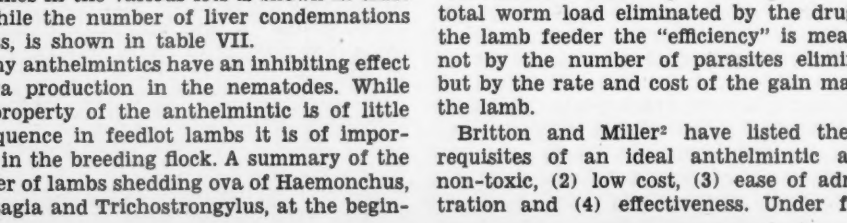
The total number of lambs passing ova at the beginning and at the end of the experiment, with the average ova count per gram of feces, is shown in table IX.

The percentage of lambs in each lot harboring various kinds of parasites and the number of parasites per infested sheep are shown in tables X and XI.

It is generally agreed among lamb feeders that the grade and fattening qualities of midwest and northwest lambs have deteriorated during the last few years. The data which have been collected in this study tend to substantiate the opinions of the sheepmen. The usual reasons given for the poor quality of the lambs are, chronic parasitism and malnutrition. The data, which have been presented, furnish considerable information about the problem of parasitism and the value of certain anthelmintic substances, but the actual reason for slow fattening of certain of the lambs, has not been ascertained. It is of interest to discuss the points in which our data agree with previous investigations and possibly offer some explanations for observations made here, which do not entirely agree with some of the other reports in the literature.

This study was undertaken to determine the anthelmintic efficiency of the various drugs and drug combinations, when used on feeder lambs. The generally accepted definition of "anthelmintic efficiency" is the percentage of total worm load eliminated by the drug. For the lamb feeder the "efficiency" is measured, not by the number of parasites eliminated, but by the rate and cost of the gain made by the lamb.

Britton and Miller[2] have listed the four requisites of an ideal anthelmintic as (1) non-toxic, (2) low cost, (3) ease of administration and (4) effectiveness. Under feedlot conditions it is possible to administer many anthelmintics in the feed so that ease of administration may become a secondary factor. Cost of the anthelmintic is important especially when feeding lambs on which the estimated margin of profit will be low. The toxicity and effectiveness will, of course, be measured in the rate and amount of gain, which will again be considered in the total cost or savings due to the anthelmintic. The initial cost of the anthelmintic and the labor necessary to administer it must also be considered in determining the cost of worming sheep. In the past it has been considered advisable to fast sheep before administering an anthelmintic. Swales[13] and Gordon[8] have advised against this practice and our own experience has been that there is no advantage and there may actually be a disadvantage in fasting sheep before treating (Eveleth and Goldsby[5]).



Method of administration of anthelmintic solution using a Whitlock nozzle attached to a Shikes syringe

Summaries of the data obtained in these

experiments have been presented in tables I to XI inclusive. In table I the final fattening ration and the prices quoted in June, 1946, are given. This ration appears to be quite satisfactory and has been used by Armour and Company at West Fargo for fattening a large number of lambs. The cost, at the time the prices were quoted, was 2.19 cents per pound.

Table II gives the chemical composition of the various anthelmintic substances used. The alkaline anthelmintic and the copper sulfate-nicotine sulfate mixtures were prepared in our laboratory. The others were as marketed; the stated ingredients being copied from the labels.

The methods of administration are given in table III. The total dose of anthelmintic substances has been computed in those lots receiving medicated salt by adding the initial dose to the amount eaten with the salt.

Table IV summarizes the amount of feed, salt, grade changes, weight changes, gain, and cost per unit gain. The average amount of ration eaten per lamb per day was 3.88 pounds with a range of 3.69 pounds for Lot 18 to 4.15 pounds for Lot 16. The range of feed consumption is slight and does not appear to be significant. The amount of salt consumed per day per lamb varied from 5.1 grams in Lot 6 to 13 grams in Lot 15 with an average of 9.3 grams. For the non-medicated salt the range was 10.7 to 13 grams per day while for the phenothiazine and salt mixtures the salt consumed ranged from 5.1 to 8.4 grams. The lots receiving par-ex with the salt consumed 6.8 to 9.5 grams of salt per day. Thus Lot 3 consumed .71 grams phenothiazine per day per lamb, Lot 5, .84 grams phenothiazine per lamb per day and Lot 6, .51 grams of phenothiazine per lamb per day. The lambs in lots 8, 12, and 13 ate .68, .64, and .49 grams of par-ex per day per lamb.

The average initial grade varied from 2.42, in Lot 15, to 2.67, in Lot 17. The total average initial grade was 2.55. The average final grades varied from 3.92 in Lot 5 to 4.60 in lots 8 and 17. The smallest difference between final grade and initial grade being 1.29 in Lot 5 while the greatest difference between initial and final grade is 1.96 in Lot 8. The five lots which made the greatest change in grade are 7, 8, 9, 13, and 17. These all started as very close to the total average grade. The five lots having the greatest final weight were 1, 5, 6, 10, 11. The average initial weights for lots 1, 10, and 11 were very close to the total average while lots 5 and 6 were slightly heavier. Lot 11 made the greatest weight gain of 20.4 pounds while Lot 17 made the smallest weight gain of 12.8 pounds.

The gain per day which is of more significance since it eliminates differences in initial weights was greatest in Lot 11 where the average gain was 0.425 pound per day. The lot making the smallest gain per day was Lot 17 which averaged only 0.266 pound per day. The six lots making the highest gains per day were lots 1, 7, 9, 11 and 13. However, statistical analysis of the gains in weight failed to show any significant difference.

TABLE II.—COMPOSITION OF ANTHELMINTICS USED

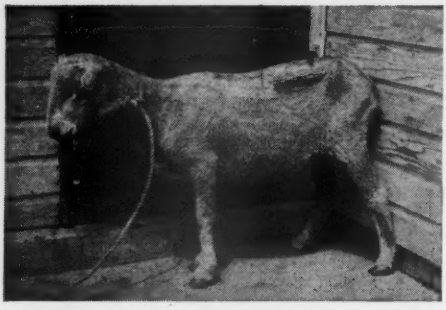
Alkaline Anthelmintic	
Copper sulfate $CuSO_4 \cdot 5H_2O$	4.30%
Sodium arsenate $Na_2HAsO_4 \cdot 7H_2O$	2.10
Ammonium carbonate $(NH_4)_2CO_3$	1.60
Sodium bicarbonate $NaHCO_3$	54.20
Nicotine sulfate 40% solution	1.60
Wettable phenothiazine	36.20
Phenothiazine (Label)	
Phenothiazine NF	98.84%
Lorol alcohol 0.5, Polyvinyl alcohol 0.4, Algin, and Coumarin NF	1.16
Par Ex	
Phenothiazine NF	70.15%
Nicotine sulfate 40% solution	7.31
Copper sulfate	3.65
Bentonite and water	26.60
Trol Formula No. I	
Phenothiazine unconditioned	11.35%
Nicotine sulfate 40% solution	1.18
Copper sulfate commercial	1.18
Brewers grains, bentonite, hydrocarbon oil, flavor, and water	86.29
Trol Formula No. II	
Phenothiazine	22.70%
Nicotine sulfate 40% solution	1.18
Brewers grains, bentonite, hydrocarbon oil, flavor and water	75.648
Copper sulfate	1.18
Copper Sulfate-Nicotine Sulfate	
Copper sulfate crystals	50.00%
Nicotine sulfate 40% solution	50.00
Arsoformin	
Arsenic Trioxide	1.00%
Copper sulfate, solution of formaldehyde and base	99.00
Tetrachlorethylene	
Tetrachlorethylene	99.995%
Inert	.005
Kamala-Nicotine Sulfate-Copper Sulfate Per Tablet	
Extract Kamala	43.50%
Nicotine sulfate 40% solution	13.00
Copper sulfate	43.50

The pounds of feed required to make a pound of gain is very important to the sheep feeder. Lot 11 required only 8.8 pounds of feed per pound of gain while Lot 16 required 15.2 or nearly 73% more feed than did Lot 11. The four lots making the most economical gains were 1, 7, 11, and 13. The lowest cost as shown in Lot 11 of 19.27 cents per pound is too high for economical feeding of lambs.

An attempt has been made to interpret the summary of the data in table IV by means of

the more complete data of the various lots as shown in the following tables.

Table V gives the live weight as determined by group weighing instead of individual weighing and the dressed chilled weight, the yield, and the carcass classification. Through a misunderstanding the individual identity of the carcasses was lost in the chilling room and the complete evaluation of these data cannot be made. Lots 4, 12, and 15 are excluded because of errors. Lot 6 had the lowest yield of 42.67% while Lot 17 had the highest of 46.47%. There appears to be no logical explanation for the two extremes, the untreated control Lot 17 and the phenothiazine and salt treated Lot 6. As shown in table IV the rate of gain and feed



Non-winter treated ewe heavily infested with stomach and intestinal parasites

per pound of gain and weights are quite similar for these two lots. The lambs in Lot 17, however, graded much higher at the end than did those in Lot 6. Statistical analysis of the data on grade reveals no significant difference between lots at the start of the trial. At the end of the trial a comparison of the 17 treated lots with the control lot shows that the untreated control lot graded significantly higher. Rietz & Wilson[11] have made somewhat similar observations.

The nodules on the intestines of sheep previously infested with Oesophagostomum spp. offered one means of determining the degree of earlier parasitism in the lambs. In table VI the number of lambs with no nodules, 1-10 nodules, and more than 10 on the small and large intestines has been shown. It can be seen that 89 of 435 lambs showed evidence of having been infested previously with nodular worms. This is 20.5%, which indicates a degree of failure on the part of the sheep raisers in controlling this parasite. The packer is interested in both nodular worms and the fringed tapeworms since these two parasites are the cause of condemnations which cannot be anticipated from antemortem inspection. In table VII, the number of liver condemnations on the 435 lambs, slaughtered in this study, is shown. There is little to compare, since there was a low incidence of Thysanosoma infestation of the livers—16 of the 435 or 3.68%. The data given in table XI show a greater incidence of Thysanosoma in the intestines.

In order to get an estimate of the worm load of the lambs when put into the feed lots, preliminary fecal ova counts were made. Ova counts also were made at the time of slaughter. The number of lambs passing ova of Haemonchus, Ostertagia, and Trichostrongylus, at the beginning and at the end of the feeding period, are shown in table VIII. There were extreme variations in the number of lambs in each lot, that were passing ova, at the beginning of the feeding trial. The later parasite counts showed that the infestations were considerably heavier than indicated by the ova counts. The number of lambs passing ova at the end of the feeding period was much smaller than at the beginning. These data would suggest that in the absence of fresh infestations a period of approximately 50 days on dry feed markedly lowers the number of Haemonchus ova. This observation tends to confirm the findings of Hawkins, Cole, Kline and Drudge[10] who observed high ova counts in the spring soon after the sheep were put on pasture, but a subsequent decrease that was maintained throughout the grazing season. The data for the Ostertagia tend to follow the same trends as the Haemonchus in decided decreases in the number of lambs excreting ova.

Data for the total number of lambs passing parasite ova of any kind at the beginning and at the end of the feeding period are shown in table IX. In all parasite ova counts records were made of the presence or absence of coccidia oocysts. At no time were significant numbers found. The marked decrease in number of sheep passing ova and in the number of ova passed, is at once apparent even in the untreated lot.

In tables X and XI, the percentage of infested lambs is given and also the average number of parasites per infested lamb, at the time of slaughter. To test the efficiency of each treatment we can compare the percentage of infested lambs with the total average and with Lot 17. Lot 17 was 79% infested with Haemonchus, while the total average rate of infestation was 30%. All treated lots were lower than Lot 17 which suggests that all treatments used were more or less effective against Haemonchus, with the treatments administered lots 7, 9, 10, 11, 12 and 13, showing the highest efficiency. For Ostertagia the same general trend holds with lots 10, 11 and 12 having the lowest number of infested lambs. None of the treatments was very effective against the Trichostrongylus as the lowest per-

TABLE III.—SUMMARY OF THE ANTHELMINTIC TREATMENT

Pen No.	Phenothiazine gm.	Copper Sulf. gm.	Nico. Sulf. Sol. 40%	Sodium Arsen. gm.	Method of Administration
1	9.4	1.12	.42	.55	Drench 60cc W
2	21.72	2.58	.96	1.26	Fed in feed—2 doses, 21-day interval
3	47.51	1.12	.42	.55	Drench 60cc W P
4	25.00				Drench 120cc W
5	70.04				Drench 120cc W P
6	34.10				P
7	25.00				Fed in feed—single dose
8	41.40	2.45	4.33		Drench 60cc W PE
9	13.62	1.42	1.42		Fed in feed—single dose
10	27.20	1.42	1.42		Fed in feed—single dose
11	27.20	2.82	2.82		Fed in feed—2 doses, 21-day interval
12	48.10	2.69	3.98		Fed in feed PE
13	46.10	2.41	3.39		Fed in feed PE
14		1.20	1.20		Drench 120cc W

W—Whitlock dosing nozzle. P—Phenothiazine in salt 1:9. PE—Par-Ex in salt 1:14.

Pen 15 was drenched with 0.001gm of arsenic trioxide per pound body weight; pen 16 received 5cc of tetrachlorethylene in gelatin capsules; pen 17 received no treatment, and pen 18 received a tablet containing extract of kamala 1.33gm, nicotine sulfate (40%) 0.4gm and copper sulfate 1.33gm.

TABLE IV.—SUMMARY OF FEEDS, GRADES, WEIGHTS AND COSTS

Pen No.	No. lambs	Ration lb. per day	Gm salt per lamb per day	Initial grade	Grade improvement	Initial wt. lb.	Gain lb.	Lb. gain per lamb per day	Lb. feed per lb. gain	Cost per lb. gain
1	24	3.90	11.7	2.54	1.76	82.5	19.0	.396	9.85	21.57
2	25	3.76	11.1	2.63	1.57	82.5	14.1	.300	12.5	27.38
3	25	3.77	7.1	2.63	1.45	82.5	14.9	.310	12.2	26.72
4	23	4.12	11.4	2.43	1.74	81.5	15.4	.321	12.8	28.03
5	24	3.95	8.4	2.63	1.29	86.5	16.8	.357	11.1	24.31
6	24	3.95	5.1	2.58	1.38	87.3	13.0	.271	14.6	31.97
7	25	3.79	8.7	2.52	1.88	80.0	18.8	.392	9.7	21.24
8	25	3.79	9.5	2.64	1.96	78.1	17.9	.373	10.4	22.78
9	23	4.04	9.6	2.57	1.93	78.7	18.0	.375	10.8	23.65
10	24	3.97	9.1	2.63	1.77	83.1	18.0	.375	10.6	23.21
11	25	3.73	10.7	2.44	1.52	81.0	20.4	.425	8.8	19.27
12	25	3.74	8.9	2.52	1.78	79.0	16.0	.333	11.2	24.53
13	24	3.97	6.8	2.50	1.80	79.3	19.3	.402	9.9	21.68
14	25	3.79	12.0	2.56	1.64	80.8	17.2	.351	10.8	23.65
15	23	4.04	13.0	2.42	1.62	82.5	14.4	.300	13.5	29.57
16	23	4.15	8.1	2.44	1.56	85.6	13.0	.273	15.2	33.29
17	24	3.72	9.1	2.67	1.93	86.6	12.8	.266	13.98	30.62
18	24	3.69	7.9	2.54	1.59	77.0	17.0	.354	10.4	22.78
Average	24.2	3.88	9.3	2.55	1.68	81.9	16.4	.343	11.57	25.35

TABLE V.—LIVE WEIGHT, DRESSED WEIGHT, YIELD AND CARCASS CLASSIFICATION OF LAMBS

Pen No.	Number killed	Live wt. lb.	Dressed chilled wt. lb.	% yield	Lambs					Yearling			
					AA	A	B	C	Cull	A	B	C	Cond
1	24	2425	1078	44.45	9	7	3	1		1	1	2	
2	25	2400	1067	44.46	10	10	3	2					
3	24	2400	1080	45.00	9	4	2	4	1	2	1	1	
4	23	2270	959	42.25	4	9	4		1	2	2		*1
5	24	2450	1092	44.57	7	8	5			3		1	
6	24	2470	1054	42.67	2	11	5			3	2	1	
7	25	2455	1093	44.52	3	10	5			3	4		
8	25	2350	1067	45.40	7	7	6	1		3		1	
9	23	2280	996	43.68	8	8	3	1			3		
10	24	2405	1051	43.70	7	9	6			1	1		
11	25	2525	1101	43.56	5	11	5				1	3	
12	**24	2320	1000	43.10	5	11	5			1	1	1	
13	24	2385	1051	44.06	9	7	2	1		5			
14	25	2495	1078	43.21	8	8	2			1	3	3	
15	**24	2470	1071	43.36	5	7	3	2		3	2	2	
16	23	2295	997	43.44	5	7	6				5		
17	24	2410	1120	46.47	8	6				4	4	2	
18	24	2305	1030	44.68	3	12	3	2		2	2		

* Abscess. ** Transposition of carcasses.

TABLE X.—PERCENTAGE OF LAMBS INFESTED AND AVERAGE NUMBER OF PARASITES PER INFESTED LAMB

Pen No.	Haemonchus	Ostertagia	Trichostrongylus	Nematodirus	Moniezia spp.	Trichuris

TABLE I.—COMPOSITION AND MARKET PRICE* OF FINISHING RATION

Ingredient	Amount	Cost
Ground alfalfa hay	400	$28.00 T.
Grain screenings	400	34.50 T.
Pea size oilmeal (34% protein)	100	71.00 T.
Ground yellow corn	840	1.58 bu.
Cane molasses	200	2.25 cwt.
Meat and bone scrap	20	4.90 cwt.
Limestone	20	.80 cwt.
Cost per pound of ration		0.0219

*Prices quoted June, 1946.

TABLE VI.—SUMMARY OF THE NUMBER OF LAMBS SHOWING NODULES AND THE NUMBER OF NODULES ON THE INTESTINES

Pen No.	Without nodules	Large intestines 1-10	Large intestines 10+	Small intestines 1-10	Small intestines 10+	With nodules
1	21		3		3	3
2	19	1	5	1	4	6
3	21		3		3	3
4	20		2		3	3
5	24		1			1
6	16	1	6	2	1	7
7	18	2	5	1	2	7
8	19	1	5		3	6
9	15	2	5	2	2	7
10	21	1	3	1	1	4
11	20		5	1	3	5
12	22		3		3	3
13	17		7		5	7
14	16		8		5	9
15	18	3	4	1	4	7
16	19	1	2		1	3
17	20	1	2		1	4
18	20		4		3	4
Total	346	13	73	9	47	89

TABLE VII.—NUMBER OF LIVER CONDEMNATIONS

Pen Number	Number Condemned	Pen Number	Number Condemned
1	0	10	0
2	2	11	0
3	1	12	1
4	1	13	0
5	3	14	0
6	4	15	0
7	1	16	1
8	2	17	0
9	0	18	0

TABLE VIII.—NUMBER OF LAMBS ELIMINATING OVA OF (1) HAEMONCHUS, (2) OSTERTAGIA AND (3) TRICHOSTRONGYLUS AT THE BEGINNING AND AT THE END OF THE EXPERIMENT

Pen No.	*Haemonchus contortus* Initial	*Haemonchus contortus* Final	Ostertagia Initial	Ostertagia Final	Trichostrongylus Initial	Trichostrongylus Final
1	8	0	11	0	12	2
2	1	0	5	0	7	2
3	9	0	13	0	16	3
4	11	0	11	1	16	0
5	13	0	13	0	17	2
6	5	2	6	0	11	1
7	3	0	5	3	4	3
8	3	0	3	0	3	1
9	3	1	3	1	5	3
10	2	0	1	0	10	2
11	3	0	4	0	10	0

* Abscess. ** Transposition of carcasses.

TABLE X.—PERCENTAGE OF LAMBS INFESTED AND AVERAGE NUMBER OF PARASITES PER INFESTED LAMB

Pen No.	Haemonchus		Ostertagia		Trichostrongylus		Nematodirus		Moniezia spp.		Trichuris	
	*	**	*	**	*	**	*	**	*	†	*	**
1	50	94	42	315	83	28	42	98	4	1	71	7
2	24	134	56	86	68	19	24	465	0	0	84	6
3	40	47	56	316	64	90	40	297	4	11	88	8
4	26	64	52	229	52	47	17	141	9	7	78	3
5	21	2	21	501	42	36	21	47	0	0	83	6
6	67	441	38	306	75	48	42	259	4	8	54	6
7	8	30	40	236	64	38	20	130	12	5	64	5
8	12	74	34	331	48	78	16	369	4	3	80	9
9	9	20	44	340	57	40	44	200	9	14	70	6
10	4	2	17	69	56	38	38	210	17	13	83	7
11	0	0	8	138	36	75	12	62	8	2	80	8
12	5	15	16	341	75	17	32	520	12	9	92	6
13	4	1	25	38	46	93	25	305	4	5	83	5
14	64	294	40	904	72	18	48	181	20	2	80	6
15	70	244	74	890	78	85	26	274	0	0	78	6
16	35	444	35	249	52	68	35	392	4	11	78	8
17	79	686	42	305	71	63	33	257	4	1	89	9
18	29	522	58	616	63	13	38	134	21	3	67	7
Average	30	173	39	345	61	49	31	241	8	5	77	7

* Percentage of total number of lambs in the pen.
** Average number of parasites per infested lamb.
† Grams of Moniezia proglotids per infested lamb.

TABLE XI.—PERCENTAGE OF LAMBS INFESTED AND AVERAGE NUMBER OF PARASITES PER INFESTED LAMB

Pen No.	Chabertia		Strongyloides		Cooperia		Thysansoma		Bunostomum		Oesophagostomum	
	*	**	*	**	*	**	*	†	*	**	*	**
1	8	2	54	393	13	299	4	12	4	120	0	0
2	8	4	52	221	20	1372	32	3	0	0	0	0
3	12	1	24	400	4	311	4	1	8	64	0	0
4	17	3	48	254	13	172	9	3	4	5	0	0
5	8	2	21	594	8	113	21	2	0	0	0	0
6	29	4	33	205	8	341	4	2	0	0	0	0
7	16	4	28	169	8	487	8	1	8	29	4	2
8	16	2	44	1686	8	133	16	2	0	0	4	2
9	9	3	44	216	13	337	13	3	4	53	4	1
10	21	3	58	660	4	192	13	2	0	0	0	0
11	12	9	60	298	8	405	0	0	4	333	0	0
12	16	15	56	340	0	0	8	2	4	130	0	0
13	21	1	54	508	4	16	4	5	0	0	0	0
14	12	3	64	356	20	386	4	2	12	82	8	1
15	17	22	57	425	22	478	13	3	4	136	9	13
16	17	15	48	315	9	125	17	35	0	0	0	0
17	17	2	46	358	8	651	17	4	0	0	4	28
18	33	3	46	357	8	922	4	4	0	0	4	1
Average	16	5	47	431	10	374	11	3	3	53	2	3

* Percentage of total number of lambs in pen.
** Average number of parasites per infested lamb.
† Grams of Thysansoma proglotids per infested lamb.

TABLE XII.—COMPARISON OF AVERAGE WEIGHT GAIN AND PARASITE LOAD OF FIVE RAPIDLY AND FIVE SLOWLY GAINING LAMBS IN EACH LOT

Pen No.	Initial Grade		Final Grade		Weight Gain		Average No. Parasites*	
	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest
1	1.4	1.8	2.2	4.2	9	26	137	1902
2	2.4	2	3.8	3.8	7.2	22	311	1304
3	2.2	2.4	3.3	4.1	6.7	25	2121	1436
4	3	3	4	4.4	6	27	378	429
5	2.8	2.2	4	4.1	6.7	27.7	580	914
6	2.2	2.5	3	4.6	2.2	24.3	435	2092
7	2.8	2.2	4.2	4.4	7.2	27.8	405	774
8	2.8	2.7	4.5	5	12.6	23.8	887	221
9	2.6	2.9	4.2	5.5	6.8	28.6	906	207
10	3.2	2.4	4.4	4.6	11	24	1245	375
11	3	2.4	4.4	4.3	12	29	85	551
12	3.4	1.6	4.8	4	5.2	28.8	394	617
13	2.6	1.8	3.8	4.2	9.8	27.6	2101	1150
14	3	2.5	4.8	4.8	9.4	26.2	266	4222
15	2.8	2.6	3.8	4	8	22.4	2073	2141
16	3	2.2	4.4	4.4	—.6	29.2	1446	1279
17	3	2	4.3	4.6	4.2	27.4	883	2106
18	2.8	2.2	4	4.2	9.3	35.2	2846	1105
Average	2.7	2.4	3.99	4.4	7.37	26.8	972	1268

*Cestodes not included.

Pen No.	Initial		Final	
	Number passing ova	Average No. per gm feces	Number passing ova	Average No. per gm feces
1	18	629	2	90
2	9	211	2	60
3	20	1502	3	60
4	20	839	1	60
5	18	1022	3	60
6	14	1376	3	80
7	10	178	8	75
8	8	182	1	60
9	7	254	4	90
10	10	1564	2	60
11	13	520	0	0
12	6	110	0	0
13	10	169	0	0
14	8	153	0	0
15	7	2497	2	130
16	4	255	3	120
17	13	1962	3	130
18	8	428	4	60

TABLE IX.—NUMBER OF SHEEP PASSING OVA AT THE BEGINNING AND AT THE END OF THE EXPERIMENT

TABLE XIII.—AVERAGE PARASITE LOAD, GRADE AND WEIGHT OF EACH THIRD OF TWO HIGH AND TWO LOW GAINING LOTS

Pen No.	Parasite Load Per Sheep			Difference in Grade			Total Gain		
	1	2	3	1	2	3	1	2	3
1	62	429	2054	2.13	1.75	1.5	15.5	16.5	17.75
11	5	150	1611	1.5	1.75	1.43	20.25	18.88	42.14
6	140	685	1222	1.38	1.5	1.38	8.75	11.75	18.5
17	152	970	3346	2	2	2	12.38	12.5	18.5

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centage of infestation was in Lot 11—36%. Lots 4, 5, 7, 8, and 11 were all less than 25% infested. The number of worms per infested lamb showed that lots 5 and 11 were definitely lower than the others.

The infestation with Moniezia was so erratic that an interpretation is impossible. None of the treatments was efficacious against Trichuris.

Lots 1, 2, 5, and 9 were lowest in Chabertia infestation.

Lots 3, 5, and 7 were the only ones showing less than 30% infestation with Strongyloides. Cooperia infestation was erratic but lots 3, 10, 12, and 13 were all lower than the control lot.

The control Lot 17 had a 17% infestation with Thysanosoma. Lots 2, 5, 8, and 16 all had approximately the same or greater degrees of infestation.

The high value for Lot 2 is of especial interest since the other two lots, 1 and 3, received less than half as much of the same parasiticide. This would indicate that the copper sulfate when fed in a dry alkaline salt is not effective against this intestinal parasite. With the exception of Lot 6, all other lots having a low infestation with Thysanosoma were treated with copper and nicotine.

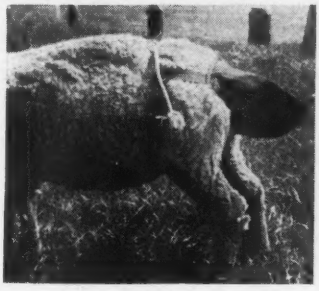
The incidence of Bunostomum and Oesophagostomum infestations was in general quite low and nothing can be said about the efficacy of the various treatments given.

To determine further the effect of parasites present in the alimentary canal the compilation of data in table XII is presented.

The initial and final grades, and parasite loads of the average of the five lambs making the lowest gains is compared with similar data of the five lambs making the highest gains in each lot.

The average for the 18 lots is of particular interest. The initial average grade of the low group is 2.7 while the high group is 4.4 or a change of 1.29 for the low and a change of 2.0 for the high. In other words, the higher gaining group also benefitted by a greater change in grade. The weight change was 7.37 pounds for the lower group while it was 26.8 pounds for the higher group. The parasite load for the low gaining group was 972 while for the high gaining group was 1268. These data clearly show that a factor or factors other than the parasite load was responsible for the wide discrepancies in the weight gains of the various experimental lambs.

The data which have been presented have been considered from various points of view. First, we can conclude that the elimination of parasites increased the rate and economy of gain since the control Lot 17 made the poorest showing of any of the lots. Second, we must conclude that the extremely slow rate of gain of certain individuals in each lot was not due to parasites present during the feeding period, because, on examination, most of the slowly gaining lambs in each lot harbored fewer parasites than did the lambs that gained rapidly.



Illustrating bag designed for collection of feces*

Doll and Hull[4] have concluded that many parasitized lambs reach a condition from which recovery is impossible. Many more are so debilitated that there is little hope of restoring them to profitable animals by curative methods. This factor may have played some part in some of these lambs but it was not the only one. Data presented in table VI shows that 20.5% of these lambs had been previously infested with nodular worms. The average gain for the lambs having nodules on their intestines is 17.08 which is higher than the average for all pens.

Further evidence that the parasite load was not entirely responsible for the variations in rate of gain can be found in table XIII. Here are compared lots 1, 11, 6, and 17 as the extremes of the rates of gain. The worm counts of the lambs were listed in ascending order and then divided into three equal parts as shown. The difference in grades and total gains are shown for each group. It can be seen readily that the grade differences were of no significance while the higher the parasite load the greater the gains.

Of the 435 sets of viscera examined 42 tapeworm cysts were found in 30 sheep—6.9%.

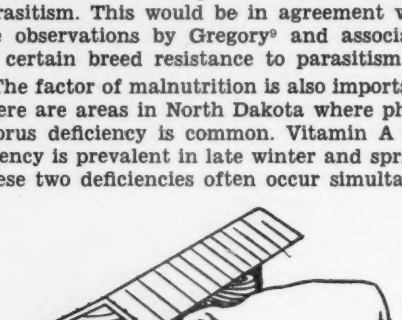
To explain the reasons for some of the findings reported here, it would be necessary to have some complete histories of the lambs and additional means of determining the factors responsible for rate of gain. It appears worth while, however, to point out some factors that may, in part, contribute to an explanation of our findings.

The type of lamb marketed as a feeder has changed during the last two decades. The use

*Complete description of construction of bag, *Vet. Med.*, 41:11, p. 399. 1946.

of pure bred rams in small flocks is more common than in earlier years. Certain genetic factors may have been introduced into some flocks that make certain individuals more resistant or more susceptible to the effects of parasitism. This would be in agreement with the observations by Gregory[9] and associates on certain breed resistance to parasitism.

The factor of malnutrition is also important. There are areas in North Dakota where phosphorus deficiency is common. Vitamin A deficiency is prevalent in late winter and spring. These two deficiencies often occur simultaneously and may exert such a stunting effect that the lambs do not overcome the malnutrition during a short feeding period. There is also evidence that copper and cobalt deficiencies may exist within the state. The late summer scours, sometimes ascribed to trichostrongylosis or chabertiosis, may be, in part, a toxic condition similar to the molybdenum poisoning reported by Dick and Bull[3] from Australia. These workers also found that molybdenum tended to decrease the body stores of copper so that a copper deficiency could exist although the intake was adequate.



The type of feed box recommended by the USDA may be used for phenthiazine in salt 1:9 or par-ex in salt 1:9

There are areas of seleniferous soils in North Dakota which may also be a factor in producing lambs that fatten at a very slow rate.

It is generally assumed that, with the exception of the nodular worm, the removal of the parasite constitutes a cure for the disease produced by the parasite. Threlkeld[16] has described the burrowing of the Ostertagia into the abomasum. We have observed some lambs in which the walls of the abomasum were definitely thickened as a result of numerous infestations with this parasite.

Chronic trichostrongylosis may also be extremely difficult for the lamb to overcome. It requires large numbers of these worms to produce serious symptoms in well nourished lambs. However, the presence of relatiyely small numbers seem to act as a serious debilitating factor in lambs that have been poorly nourished and then placed on adequate feed.

Andrews, Kaufman, and Davis[1] have shown that *Trichostrongylus colubriformis* is highly pathogenic when present in sufficient numbers.

There is relatively little information published on the comparative value of different anthelmintics for feedlot lambs. Thorning, Sampson, and Graham[15] used various methods of administering phenothiazine to feedlot lambs and used untreated lambs as their controls. There is, of course, a voluminous literature on the anthelmintic value and toxicity of phenothiazine. For complete discussion of this subject the reader is referred to the reviews by Stewart,[12] Swales[14] and Gordon.[7]

At the present time there appears to be a definite lack of information on the possible toxic effect of phenothiazine on worm-free sheep.

In this study there is no adequate control for a measurement of toxicity of the various anthelmintics. It is suggested, however, that large doses of arsenic and tetrachlorethylene were deleterious to the lambs.

An interpretation of the statistical analysis which may be of aid in interpreting the results is as follows:

Analysis of worm count data revealed that the treatments given pens 18 (kamala, copper sulfate and nicotine sulfate), 8 (par-ex as a drench followed by par-ex in salt), 3 (single dose of alkaline anthelmintic followed by phenothiazine in salt), 16 (tetrachlorethylene) and 6 (phenothiazine in salt) had no significant effect in reducing the parasite load when compared to the control group 17.

Treatments given lots 14 (single dose of copper sulfate, nicotine sulfate) and 15 (arsoformin) were not effective. At the end of the trial they harbored significantly more worms than the control group. All other treatments resulted in a significant reduction of parasites.

Further analysis of the data on the groups given effective treatments shows that there was no significant difference between the three methods of adminstering the alkaline anthelmintic nor is there a significant difference between the lots given the alkaline anthelmintic and the lot given par-ex as a drench followed by par-ex in the salt.

A comparison of the lots receiving phenothiazine with those receiving par-ex and trol showed no significant difference between the two groups of treatments.

Statistical analysis showed that par-ex was less effective in lowering the worm count than either trol or phenothiazine.

Statistical analysis of data on gain in weight revealed no significant difference in gains in weight between the different treatments used.

Statistical analysis of the data on count of various species of worms leads to the following conclusions:

The treatments differed significantly in effectiveness against Ostertagia with treatments in lots 13, 10, 2, 12 being most effective and treatments 14, 15, 18 being least effective. For other species of worms the treatments did not differ significantly.

Summary

The data obtained in this study indicate:

1. Feeder lambs, picked at random may or may not make satisfactory gains in the feed lot and the results cannot be predicted by use of market grade, weight, or fecal parasite ova count standards.

2. A ration containing all of the known nutrient requirements plus an abundance of water, both being available at all times, will not insure economical gains.

3. The parasite load may be secondary to the rate of gain.

4. The removal of the majority of the worm parasites tended to increase both the rate and the economy of gain.

5. A mixture of phenothiazine, copper sulfate and nicotine sulfate given twice at a 21-day interval was the most efficient as an anthelmintic and these lambs produced the most economical gains.

6. Arsenic and tetrachlorethylene appeared to have a toxic effect that is detrimental to rapid, economical gains for feeder lambs.

7. Phenothiazine in the feed appeared to be more efficient than the same dose administered as a drench.

8. It does not appear necessary to use a phenothiazine salt lick for feeder lambs.

9. The possibility of factors other than parasitism acting as a retarding effect on the fattening of feeder lambs is discussed.

Acknowledgement

The authors wish to express their thanks to the many who have cooperated in this study. Many names will have to be omitted, but especial appreciation is felt for the assistance of Miss Pat Campbell, Mrs. Nora Edhlund, Miss Margaret Frances Eveleth, Dr. James O. Foss. and Mr. Hugo Schneider all of whom assisted in the handling of the sheep and in the final examination of the viscera.

To Mr. J. E. Pyle and Mr. L. J. Hablas of Armour and Company of West Fargo, North Dakota, we express our thanks for obtaining the sheep and for the facilities of the plant.

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To Armour and Company of Kansas City we are indebted for many of the chemicals used in treating the sheep.

We also wish to express our appreciation to E. I. Du Pont De Nemours and Company for phenothiazine furnished for these experiments and other studies now under way.

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Streptomycin in the Treatment of Erysipelothrix Rhusiopathiae-Infected Turkeys

By C. G. GREY*
Washington, D. C.

THIS is a progress report to present test results of the therapeutic action of streptomycin obtained in *E. rhusiopathiae*-infected turkeys.

In a previous article, "Penicillin in the Treatment of *E. rhusiopathiae*-infected Turkeys,"[1] the history and extent of the disease in this country and a description of its gross pathological effect on turkeys are given, thus eliminating the necessity for repetition of that material in this report.

Experimental Procedure and Results

A culture of *E. rhusiopathiae*, also described in the above-mentioned article, was passed serially through three-quarter-grown turkeys until 5cc amounts of a 24-hour, broth transfer consistently killed the birds upon intrawattle inoculation.

In the author's earlier experiments,[1] penicillin, 20,000 units suspended in oil and given four times a day at 24 hour intervals, reduced mortality to 10% when 100% of untreated controls died. This with identical culture and under like conditions as in this experiment.

January 7, 1947, 50 three-quarter-grown turkeys were exposed, *via* the wattles, to 5cc amounts of transfers of the previously mentioned culture. Twenty-four hours later, prior to treatment, all of the turkeys were visibly ill. Treatment and results were as follows:

January 8, 1947, 24 hours after exposure to *E. rhusiopathiae*, treatment with streptomycin was started. In order to minimize handling of the birds treatment was limited to one dose.

The streptomycin used in this test was dissolved in distilled water so that each cubic centimeter contained 140,000mcg (units).

Each of the birds in group 1 (10 birds) received a single 4cc dose of the streptomycin solution (560,000mcg) *via* the wattles. Likewise, in groups 2 and 3 (10 birds in each group) each of the birds received single doses of 2cc (280,000mcg) and 1cc (140,000mcg) respectively *via* the wattles. All of the turkeys of these three groups recovered.

In group 4 (10 birds) a single 0.5cc dose of the streptomycin solution (70,000 mcg) was administered to each of the birds *via* the wattles. Three of the birds of this group died of *E. rhusiopathiae* infection.

Eight of the 10 untreated control birds died of the disease.

Bacteriological examination of 22 (62%) of the turkeys that survived treatment, and also the two (20%) turkeys that recovered without treatment, revealed that all were free of *E. rhusiopathiae* upon their release 35 to 38 days after treatment was started.

Tom and hen turkeys were distributed evenly throughout this experiment with the result that again[1] no sex-linked difference in susceptibility of turkeys to artificial exposure with *E. rhusiopathiae* was noted.

Summary

Streptomycin administered to each *E. rhusiopathiae*-infected turkey in a single dose at the rate of 140,000mcg or more was 100% effective in preventing death, under the conditions of this experiment, when 80% of the untreated control birds died.

There is no sex-linked difference in susceptibility of turkeys to artificial exposure with *E. rhusiopathiae*.

Bacteriological examination of 22 (62%) of the turkeys that survived treatment, and also the 2 (20%) turkeys that recovered without treatment, revealed that all were free of *E. rhusiopathiae* upon their release 35 to 38 days after treatment was started.

*Pathological Division, Bureau of Animal Industry, Agricultural Research Administration, U. S. Department of Agriculture, Washington 25, D. C.

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The Cooperation of Veterinary and Human Medicine in the Solution of Common Problems

By DRAGUTIN HOMAN
Tierarztliche Hochschule
Vienna, Austria

THE domestication of animals, resulting in a close relationship of man and animals which gave a new scope to various diseases, created an important medical problem. Communicable disease, transmissible from animals to man, the parasites embracing both man and animals in their development and the poisoning of man by contaminated meat become most important. The diseases resulting are practically universal in distribution and their importance is quite significant. The problem is how to combat these kinds of disease most effectivcly.

In planning measures for the control or elimination of these diseases two essential facts must be considered. (1) They present the same danger to man as to animals, thus attracting the common interest of both veterinary and human medicine and (2) The course of some of them shows the same process in the human body as in animals. Therefore, the same principles determine the kind of measures to be used against them; and the same methods of diagnosis and treatment are applicable.

These facts force the cooperation of veterinary and human medicine in this rather large field of disease control.

The mutual exchange of experiences and scientific discoveries and the common effort of veterinary and human medicine has existed in greater or less degree from the beginning of the development of medical science.

Among the ancients, veterinary medicine contributed much more to the advance of these two professions than did human medicine. Later human medicine took over the leadership, but lately both medicines have made an almost equal contribution to progress.

A historical survey confirms the foregoing statements. In the beginning human and veterinary medicine commonly were practiced by the same personnel. The medical men of that time, however, had a wider knowledge of the animal's body than of the human body. This resulted in the achievement of greater success in the treatment of domestic animals than in the treatment of their owners. At that time, veterinary medicine was the more progressive. Anatomy as a basic subject in medical science is a classical example. The anatomical science of antiquity comprehended only the anatomy of animals. The aversion to dissecting the dead, religious taboos and legal prohibitions prevented the study of human cadavers. In consequence the knowledge of the human body, its construction and the position of organs was based upon the premise that the anatomy of man was similar to that of the animal. The same situation prevailed with pathology and physiology. Generally, the study of medicine dealt only with animals, thus veterinary medicine came to have the more solid base, which made human medicine dependent on it. During the further progress of medicine, medical colleges were established and human medicine developed from the empirical to the scientific level. From that time the human medicine assumed the place of first importance.

After the unfavorable influence of the Middle Ages on medicine, the 18th century brought another change in the relationship between human and veterinary medicine. The first veterinary colleges were established, and veterinary medicine was studied on a scientific basis. During the first period, the elaborate methods and discoveries of human medicine were employed but, later on, veterinary medicine supported human medicine by making available to it the result of veterinary research work. Veterinary medicine thus gradually became an equal factor in the general science of medicine. There is hardly a place in the field of medicine now where the mutual relation does not become evident.

The comparable study of anatomy, histology and embryology is inspired by the fact that the development of the individual already shows a resemblance in the construction of human beings and animals. They resemble each other completely in the first weeks of life, and the mature organism of man shows many features identical to those of other mammals and far more similarities than dissimilarities.

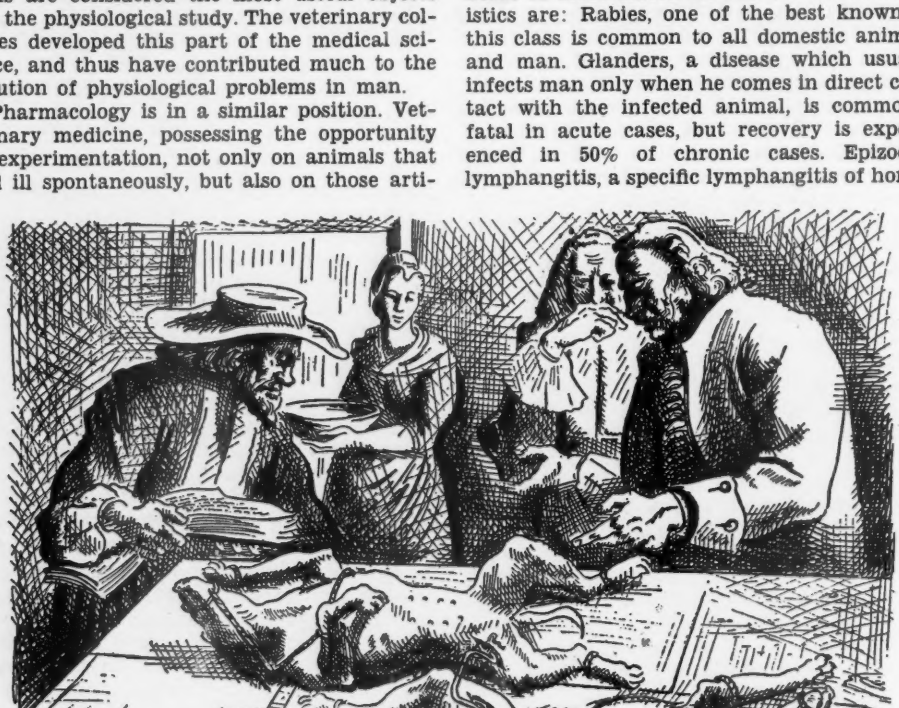
Pathology is also a fertile soil for comparative studies. In the greater part, man's organs are diseased as are those of animals and the disease process takes the same course. The comparative study of these diseases makes it possible to extend our knowledge, and supports a better understanding of the processes of morbidity.

The study of physiology occupies a particular place. All that is known about life is, in greater part, the result of experiments on animals, since experiments on persons have been made only in exceptional cases. The domestic animals are considered the most useful objects for the physiological study. The veterinary colleges developed this part of the medical science, and thus have contributed much to the solution of physiological problems in man.

Pharmacology is in a similar position. Veterinary medicine, possessing the opportunity of experimentation, not only on animals that fall ill spontaneously, but also on those artificially infected, allows for a greater scope of work than is available to human medicine. The exchange of observations and experiences can help to ensure a greater accuracy of indication and far more promising results.

The relation of human and veterinary medicines becomes especially evident in those communicable diseases which are transmissible from animal to man through direct contact and by ingestion of infected milk; also in parasitisms and intoxications caused by the consumption of infected or contaminated meat.

Numerous diseases, some of them fatal, are transmissible directly from animal to man. Some of these infections and their characteristics are: Rabies, one of the best known of this class is common to all domestic animals and man. Glanders, a disease which usually infects man only when he comes in direct contact with the infected animal, is commonly fatal in acute cases, but recovery is experienced in 50% of chronic cases. Epizootic lymphangitis, a specific lymphangitis of horses and mules caused by a fungus, is wide spread in Japan, China and South Africa. Man can become infected if the fungus get into wounds or abrasions of the skin. Infectious equine anemia is transmissible to man through the blood of sick horses. Anthrax affects all species of mammals; causes death within a few days if the infections becomes generalized. Cases of local infection of man from contact with the



Dr. Samuel Pepys, in his famous diary, wrote: "Nov. 14, 1666.—Here Dr. Croone told me that at the meeting at Gresham College tonight, there was a pretty experiment of the blood of one dog let out, til he died, into the body of another on one side, while all his own run out on the other side. The first died upon the place, and the other very well and likely to do well. This did give occasion to many pretty wishes, as of the blood of a Quaker to be let into an Archbishop and such like; but, as Dr. Croone says, may if it takes, be of mighty use to man's health, for the amending of bad blood by borrowing from a better body." Dr. Pepys' notation that transfusion 'may if it takes, be of mighty use to man's health" was surely prophetic, for today it is of tremendous therapeutic importance. Note.—Information as to the source of the above illustration has been lost. If advised as to ownership, suitable acknowledgment will be made.

sick animal, usually the hide or the hair, are very frequent.

Foot-and-mouth disease, an infection which causes, in man, a symptomatic diarrhea and vesicular eruption on the fingers and toes. Generally, adults do not suffer much, but the prognosis is sometimes unfavorable in children. The infection may occur from the consumption of infected milk or milk products and through contact with the sick animal.

Variola (cowpox, variola equina, ovina and suilla), Canadian horsepox and coital vesicular exanthema of horses and cattle, viruses which attack man, producing a mild to more or less severe eruption of the skin.

Swine erysipelas, an infection the chief victims of which are laborers in abbatoirs and those who handle sick animals or carcasses of animals dead of the disease. Frequently, these cases are fatal.

Pasteurella avicida, the bacillus of fowl cholora can also attack man, causing abscesses, whilst gastroenteritis occurs after consumption of the meat of sick fowls.

Psittacosis is transmissible by contact from sick parrots to man. The mortality rises to 40%.

Scabies of domestic animals and echinococcosis are two parasitisms attacking man by direct contact. The last one can be deadly in unfavorable cases (location in the brain). Man becomes infected from the dog bearing echinococcus tapeworm.

Sporotrichosis is an infection by fungi, resulting in subcutaneous abscesses being transmitted by contact from a sick horse or dog to man.

The fungi favus, trichophytosis and botryomycosis, all are transmissible by contact to man, resulting in furuncular processes.

Rat-bite fever may also be listed here as well as tularemia, which is transmissible to man. The same applies to *Taenia cucumerina*, a tapeworm of the dog, if the eggs, which are spread everywhere by cats and dogs, be swallowed.

In addition to the infections mentioned, the virus of hog cholera has been found in the blood of man, but in a latent form.

Milk is a source of animal diseases which attack man. By drinking milk, man can be affected by tuberculosis, undulant fever, milk sickness and septic sore throat. Milk may also be infected with scarlet fever, diphtheria, typhus and dysentery, making a transfer of these diseases to man possible. Previously mentioned diseases such as variola, foot-and-mouth disease and probably anthrax, too, may be transmitted by contamination milk.

The tapeworm of man (*Taenia solium*, *T. saginata* and *Diphyllobothrium latum*), *Opisthorchis felineus*, and often fatal *Trichinella spiralis* constitute the main parasitical diseases embracing both man and animals in their life-cycles and being transmitted by the ingestion of infected meat. Meat-poisoning, caused by the *Salmonella enteritidis* or some similar organism, occurs in the same way. Lately, the poisoning by duck eggs was found to be caused by the same organism as the poisoning of meat.

Botulism should be listed here, too, as a poisoning caused by a toxin which often results in a mortality of 40%, and affects man through consumption of improperly handled sausages and canned meat.

By touching the fresh meat and hides of slaughtered animals, man may be infected by pemphigus that is characterized by the formation of bullae, and usually damages the general health of the patient, sometimes with fatal result.

Human medicine of today is endeavoring to cure these diseases, whereas veterinary medicine is trying, without exception, to prevent them. The latter is fighting, through veterinary police regulations, against the communicable diseases being transmitted by contact from animal to man. Veterinary medicine is trying to prevent poisoning and the spreading of parasitisms transmitted through the consumption of meat, by meat inspection and the control of foods of animal origin, and is endeavoring to guard man from the danger of the diseases transmitted through the medium of milk by veterinary sanitary control of milk.

Taking into consideration the historical development of both the medicines we see the solution of the problem: how it is possible to fight more effectively against these diseases. The collaboration of veterinary medicine and human medicine must be continued, and continued on a more extensive scale than has been done heretofore.

Progressive countries have already taken the first step towards the extension of this work, and special scientific institutes for the study of the veterinary and human medicine are working with the necessary collaboration. The discussion of the common problems of both the medicines through scientific publications has been a new contribution to this common goal. Complete success in combatting these diseases can not be expected, however, until all veterinarians and physicians throughout the world accept the idea of international collaboration. This will necessitate their attendance at joint medical meetings, international medical conferences, congresses and international medical organizations, where they should study and discuss all the medical problems of common interest, and outline plans for their solution.

Streptomycin in Small Animal Practice

By JOHN E. KELLBERG
Chicago, Illinois

A TYPICAL case of mixed infection or low grade secondary infection may or may not follow a classical course of canine distemper. The clinical picture is usually one of injected mucous membranes, temperatures of 102.5 to 105° F. and a siege of diarrhea. There may or may not be a nasal discharge. Sometimes there is a persistent cough and finally champing fits or incoordination, or both.

All ordinary medication usually fails when the disease is well established. The elevated temperature persists in spite of sulfonamides, salicylates, serums, bacterins or penicillin. These cases may drag on for weeks, then comes nervous involvement, and finally death. In 35 such cases treated with streptomycin, only two have been lost.

Our first use of streptomycin was as a last resort measure. We had been called into this case at the beginning of the 5th week of illness in the kennel. There were 14 dogs, all between nine months and three years of age. Four of these puppies were immune throughout the outbreak. Six were resistant as they responded to the usual treatment; developing coughs, sometimes diarrhea but never becoming so ill as to require heroic treatment.

Of the four remaining cases, No. 1 and No. 2 (see table I) were going into their second week of fits when treatment was commenced. No. 2 had a severe pneumonia and was prostrate. Five per cent dextrose and Solu-B and injectable camphorated oil were given. Chloretone was substituted for phenobarbital to avoid the objectionable excitement stage. Ten days after beginning the treatment in this kennel, we obtained two grams of streptomycin and immediately began treatment of these two dogs with it.

Case No. 1 was nearly well in six days after streptomycin therapy was substituted and progressed rapidly to complete recovery. Case No. 2, hopeless from the start, continued toward the inevitable. The only surprise being the time it survived—six days and even then it might have lived a day or two longer, but that euthanasia was the more humane.

Case No. 3 showed the first signs of illness very late, in fact, the sixth week of the kennel infection. The mucous membranes became injected; the nicitans membranes practically covering the eyes. The temperature was persistently above normal, in spite of the usual febrifuge medication. This dog was put on streptomycin and in a few days his eyes had cleared up and temperature became normal and stayed normal.

Case No. 4 was not a severe case, but was put on streptomycin, as we now felt the results of its use in the other cases justified the expense. Recovery was prompt as shown in table I.

TABLE I.—RESPONSE OF CASES OF MIXED INFECTION TO TREATMENT WITH STREPTOMYCIN AFTER 10 DAYS OF UNSATISFACTORY ROUTINE TREATMENT

Day of Treatment	Temp.	C.MM*	Fits**	Cough	N.D.†
Case No. 1					
1st	105.0° F.	+	+	+	+
2nd	102.6° F.	+	—	+	+
3rd	103.4° F.	+	—	—	+
4th	102.4° F.	+	—	—	+
5th	102.0° F.	+	—	—	+
6th	101.6° F.	+	—	—	±
7th	101.8° F.	—	—	—	—
8th	101.4° F.	—	—	—	—
Case No. 2					
1st	105.0° F.	+	+	+	+
2nd	104.1° F.	+	—	+	+
3rd	104.6° F.	+	—	+	±
4th	102.8° F.	+	—	—	±
5th	103.0° F.	+	+	+	—
6th		+	+	—	—
Euthanasia					
Case No. 3					
1st	101.8° F.	+	—	—	—
2nd	101.8° F.	+	—	—	—
3rd	102.4° F.	+	—	+	—
4th	106.0° F.	+	—	+	—
5th	102.4° F.	+	—	+	+
6th	102.0° F.	+	—	+	±
7th	101.6° F.	+	—	—	—
8th	101.8° F.	—	—	—	—
Case No. 4					
1st	101.0° F.	—	—	+	—
2nd	101.2° F.	—	—	+	—
3rd	101.6° F.	—	—	—	—
4th	102.5° F.	+	—	+	—
5th	102.0° F.	+	—	+	—
6th	101.0° F.	+	—	+	—
7th	101.4° F.	—	—	—	—
8th	101.2° F.	—	—	—	—

*C.MM congested mucous membranes.
**Any severe nervous convulsion.
†Nasal discharge.

Subsequently in the clinic we used the drug on routine cases of uncomplicated distemper and the so-called mixed infections of older dogs.

One case in an older dog had progressed so well after only five days' treatment with streptomycin that the temperature was normal, mucous membranes had cleared and coordination was much improved. The expense forbade further employment of streptomycin

and it was discontinued. In one week, the condition of the animal had deteriorated to a degree that euthanasia was employed. This case and Case No. 2 described in the foregoing are the only ones, of 35 receiving streptomycin that have failed to recover. One would be naive indeed to expect such results to obtain generally. However, future results can fall far short of this record, as I expect them to do, and still proclaim streptomycin a valuable

There had been illness in the kennel for four weeks when the call came

adjunct to our treatment of non-specific "mixed infections" in small animals.

A strikingly similar case was treated in the same manner, but, it being possible to continue the treatment for two weeks, complete recovery followed. Incidentally, there were untreated cases of distemper in the same building during this time. They may have been the reason it was necessary to continue treatment with streptomycin in this type of case for at least two weeks. Also I may say it is our opinion, that if an animal does not show definite improvement in 72 hours, the continued use of streptomycin will not benefit it.

In exploring the range of usefulness of this new antibiotic, it was employed in a case of hemorrhagic cystitis of six months' standing. This animal was referred to the clinic by another veterinarian for laboratory studies. It was given streptomycin for two weeks. Within one week, improvement was noted and in three weeks, one week after the use of streptomycin had been discontinued, no erythrocytes nor pus cells could be found in the urine. In a few more weeks, the urine showed absolutely no pathology. Two more cases of cystitis have been treated similarly, with the same gratifying results.

Another referred case in the same category was presented for examination. A sample of urine was drawn, aseptically, for culture. The history included that of pyometra. The culture showed a gram-negative organism of the coli group. The veterinarian whose case it was, decided to use streptomycin and his report to us is that not only the cystitis, but the pyometra also cleared up.

We also had an opportunity to try streptomycin in an outbreak of feline distemper, in a cattery of extremely valuable Persians. Six cats were affected.

Table II shows the progress of the most serious case. Sulfathiazole was used in conjunction with the streptomycin in this case, but

TABLE II.—TEMPERATURE RECORD OF CAT (FLUFF O'BLUE) BEFORE AND AFTER TREATMENT FOR DISTEMPER WITH STREPTOMYCIN

	AM	M	PM	Temp. Degrees F.
1st day				
	9			107
		12		107
			4	106
			9	105.8
2nd day				
	9			105
		12		107
			4	106.6
			9	106.7
	Started Streptomycin			
3rd day				
	9			105
		12		104
			4	104.7
			9	104.4
4th day				
	9			105
		12		104
			4	104.7
			9	104.4
5th day				
	9			104
		12		104.5
			4	105
			9	104.6
6th day				
	9			103
		12		102.3
			4	102
			9	103
7th day				
	9			102
		12		102
			4	102
			9	102
8th day				
	9			102
		12		102
			4	102
			9	102
9th day				
	9			102
		12		102
			4	102
			9	102

Note.—Temperature continued normal for the following week and has stayed normal.

no serum was given. This was an extremely sick cat. She was too weak to stand and all fluid was given with an eye dropper. Her fur looked like straw. She was well along in pregnancy, but aborted. Medication was continued around the clock for 10 days. At this writing she appears normal.

Six cats in a Persian cattery were affected with distemper

As to dosage, it was necessary to establish arbitrary amounts to start from there. We are now using 0.25 grams per day, in divided doses, subcutaneously for a 20 to 30 pound dog and a dose of one-half that size, 10 to 15mg for cats.

No side effects or untoward results of streptomycin treatment have been noted. It is doubtful if the ill effects, reported in human medical literature, would be recognized in animals, if they occurred, as they are not signalized, primarily, by objective symptoms.

Conclusions

It would appear that in streptomycin, we have a most useful drug, which will accomplish much that we had hoped for from penicillin. Its main effectiveness, to date in our hands, has been in conquering those very persistent, low grade, bacillary infections that commonly complicate distemper in dogs. There is a note of encouragement to be derived in nervous cases from these experiences, but such cases have been too few in number to justify conclusions. No effect on filterable virus infections has been noted.

* * * *

Meningitis in dogs commonly causes hyperesthesia of the skin, muscular rigidity of the head and neck, epileptiform convulsions, and vomiting. The convulsions and the vomiting are more frequent in young than in mature animals.

Medical literature records no case of rabies conclusively proved to have followed the ingestion of milk from a rabid cow.—KARL F. MEYER.

* * * *

Dog Food Manufacturing is Big Business

The canned dog food industry, which was in a state of suspended animation for five years, is expected to regain its 1941 status quickly, in part because of the confidence the general public reposes in the legend "Inspected and certified by U. S. Dept. of Agr.," which is now available to canned dog food manufacturers who can meet the high standards essential to federal certification.

Before the war canned dog food attained a production of 700 million pounds annually, and constituted an important outlet for surplus farm products; requiring a total of 304,500,000 pounds of meat and meat products, 650,000 bushels of cereal products, 14 million pounds of vegetables, 21 million pounds of edible bone, 35 million pounds of protein concentrates and 4,500,000 pounds of vitamin concentrates.

* * * *

DDT Poisoning in a Cat

Subject.—A white short-haired male cat, two years of age was immersed in a 0.5% suspension of DDT (dispersible powder) because of flea infestation. This cat was treated the last thing at night. The following morning (Sunday) he showed the most alarming symptoms.

Sunday: Marked incoordination of the limbs, generalized convulsive, muscular tremors, rapid and continuous blinking of the eyelids, dilated pupils and general collapse with the tail erect and rigid.

Monday, a.m.: Completely off its legs, muscular tremors continuing, marked hyperesthesia, temperature 102° F.

Monday, p.m.: Regaining ability to stand, thirst for water, hyperesthesia less marked, movements jumpy.

Tuesday, a m.: Considerable general improvement, able to walk more decisively but apparently unable to focus objects in its path.

Tuesday, p.m.: Almost normal; eating, drinking, sleeping and bowels normal.

Treatment.—Glucose in strong coffee with added milk, warmth (blankets and hot water bottles).

General Observation.—Whether this cat possessed a special idiosyncrasy to DDT I do not know; nor is it possible to say whether the toxic symptoms were the result of absorption or ingestion.—*H. C. P. King,* M.R.C.V.S., in *Vet. Rec.*, 58:43. 1946.

Observations on The Chemotherapy of Cecal Coccidiosis*

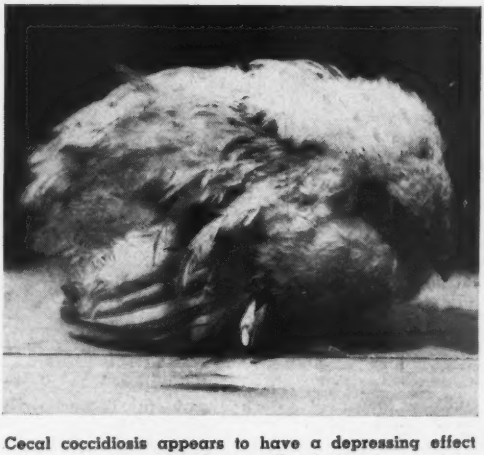
By STEPHEN GORDEUK, JR.,† MARION LEARNED† and W. T. S. Thorp†
State College, Pennsylvania

A SERIES of experiments that was conducted for the purpose of determining the value of certain sulfonamides in the treatment and prevention of cecal coccidiosis in poultry has yielded considerable practical information. The use of some of the recently synthesized sulfonamides in treating cecal coccidiosis in chickens has given particularly promising results.

Several workers have studied the effect of the sulfonamides on cecal coccidiosis. Levine[1,2,3] pioneered in this field by using sulfanilamide, sulfapyridine and sulfaguanidine. The use of sulfaguanidine against cecal coccidiosis was also studied by Farr and Allen.[4] Horton-Smith and Taylor[5,6] and Hawkins[7] observed that sulfamethazine had a beneficial effect on chickens infected with *Eimeria tenella*. Swales'[8,9,10,11] work on the use of sulfamerazine and sulfamethazine for cecal coccidiosis gave encouraging results. Farr and Wehr[12] studied the effect of sulfamerazine on coccidiosis in chickens and observed gross visceral lesions as a result of administering this sulfonamide as a therapeutic agent. Wehr and Farr[13] observed the effect of sulfaguanidine on the course of *E. tenella* infection in chickens. Seeger[14] reported favorably on the use of sulfaguanidine against cecal coccidiosis, stating that sulfaguanidine prevented losses in chicks receiving large doses of *E. tenella* oocysts. Thorp,[15] *et al.*, in a preliminary report, confirmed the work of Swales. Hawkins and others on the beneficial use of sulfamerazine in cecal coccidiosis. Thorp,[16] *et al.*, later reported on the use of sulfamerazine for cecal coccidiosis in six different experiments. Sulfamerazine was administered in varying dosages in the mash and drinking water. Infected chickens received an oral inoculation of infective *E. tenella* oocysts. Average weight gains and the mortality percentage were criteria used to compare treated and untreated groups. Tissues showing gross lesions at autopsy were sectioned and examined microscopically. Since tissue pathology was observed among both the treated and untreated birds, the spleen and liver lesions were not attributed to sulfonamide therapy. The 0.5% sulfamerazine mash gave very satisfactory results from the mortality standpoint. Favorable results were obtained with five flocks totaling 3200 chickens treated with a 0.2% drinking water solution of sodium sulfamerazine or a 0.25% sulfamerazine mash.

Experimental Procedure

The same general procedure was followed in experiments 7, 8, 9, 10, and 11 as was followed by Thorp,[16] *et al.*, in the first six experiments in the series. Four-week-old, coccidiosis-free, Barred Plymouth Rock chicks were supplied by the Department of Poultry Husbandry of The Pennsylvania State College for use in these experiments. The chickens were evenly distributed in groups of 20 and placed in clean batteries at the outset of each experiment. All chicks that were inoculated were given from 75,000 to 100,000 infective *E. tenella* oocysts orally. Pre-experimental trials on a few susceptible chicks were conducted to test the infectivity of the coccidial oocysts and determine the amount of inoculum to be used.



Cecal coccidiosis appears to have a depressing effect upon the growth rate

Weekly weights were obtained and weekly group averages were compiled. All surviving chickens except those in experiment 9 were submitted to autopsy and examined for gross lesions that may have been due to toxicity. Tissues were saved for microscopic examination from each chicken which showed gross lesions in the liver, spleen or kidney.

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†Pennsylvania Agricultural Experiment Station, State College, Pennsylvania.

A brief description of how the experiments were planned follows:

Experiment No. 7:

Pen 1—A 0.4% sulfamethazine mash was fed for three days.

Pen 2—A 0.15% chlorodiazine mash was fed for three days.

Pen 3—Sulfaguanidine, 50%, and cerelose, 50%, were given at the rate of 1.0% in the drinking water for three days.

Pen 4—A 1.0% sulfaguanidine mash was fed for three days.

Starting 24 hours after the beginning of treatment, blood samples were drawn daily for four days and analyzed for the concentration of each drug in the blood.

Experiment No. 8:

Pen 1—2.0% sulfaguanidine and cerelose in water.*

Pen 2—1.0% sulfaguanidine and cerelose in water.*

Pen 3—0.4% sulfamethazine in the mash.

Pen 4—0.2% sulfamethazine in the mash.

Pen 5—0.15% chlorodiazine in the mash.

Pen 6—0.075% chlorodiazine in the mash.

Pen 7—1.0% sulfaguanidine in the mash.

Pen 8—Untreated, uninfected controls.

Pen 9—Untreated, infected controls.

Pen 10—Untreated, infected controls.

All treatments were commenced at 72 hours following inoculation and continued for two days. Challenge inoculation two weeks after treatment.

Experiment No. 9:

Pen 1—0.4% sulfamethazine in mash for one day.

Pen 2—0.4% sulfamethazine in mash for two days.

Pen 3—0.4% sulfamethazine in mash for three days.

Pen 4—Untreated, uninfected controls.

Pen 5—Untreated, infected controls.

Treatments began 72 hours after infection. Challenge inoculation two weeks after treatment.

Experiment No. 10:

Pen 1—0.4% sulfamethazine in mash for one day.

Pen 2—0.4% sulfamethazine in mash for two days.

Pen 3—0.4% sulfamethazine in mash for three days.

Pen 4—Untreated, uninfected controls.

Pen 5—Untreated, infected controls.

Treatment at 72 hours after infection. Challenge inoculation two weeks after treatment.

Experiment No. 11:

Pen 1—0.2% sulfamethazine in mash at symptoms for two days.

Pen 2—0.15% chlorodiazine in mash at symptoms for two days.

Pen 3—1.0% sulfaguanidine in mash at symptoms for two days.

Pen 4—0.5% sulfamerazine in mash at symptoms for two days.

Pen 5—Untreated, uninfected controls.

Pen 6—Untreated, infected controls.

Challenge inoculation two weeks after treatment.

* Sulfaguanidine 50% and cerelose 50%.

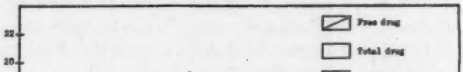
Discussion

A brief discussion of the results obtained in the first six experiments in this series is given in the review of the literature.

Experiment 7 deals with the average concentration of different sulfonamides in the blood of chickens. The blood levels represent the average of four chickens in each group.

Chickens fed a 0.4% sulfamethazine mash for a three-day period showed a cumulative effect in their blood concentrations of sulfamethazine. The blood level rose from 12.13mg of the free drug on the first day to 16.97mg on the third day per hundred cc of blood, but

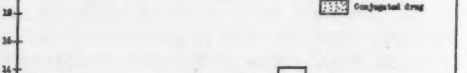
GRAPH I.—AVERAGE CONCENTRATION OF SULFATHIAZINE IN THE BLOOD OF FOUR CHICKENS WHEN GIVEN AT THE RATE OF 0.4% IN MASH



Numbers below the graph indicate days; at the left mg per 100cc of blood.

fell to less than 0.1mg per 100cc, 24 hours after the discontinuance of treatment. It appears that sulfamethazine is not retained in the blood but is quickly eliminated when treatment ceases. See graph I for a complete presentation of the results.

GRAPH II.—AVERAGE CONCENTRATION OF CHLORODIAZINE IN THE BLOOD OF FOUR CHICKENS WHEN GIVEN AT THE RATE OF 0.15% IN MASH



Numbers below the graph indicate days; at the left mg per 100cc of blood.

Chlorodiazine when administered at the rate of 0.15% in mash ranged between 7.27 and 8.62mg of the free drug per 100cc of blood. As high as 14.21mg per 100cc total drug was found in the blood, but a large portion of it was conjugated. Nearly 4mg of chlorodiazine per 100cc was present in the blood 24 hours after treatment. The results would indicate that chlorodiazine is not eliminated from the blood of chickens as rapidly as sulfamethazine. See graph II for details on the blood concentration of chlorodiazine.

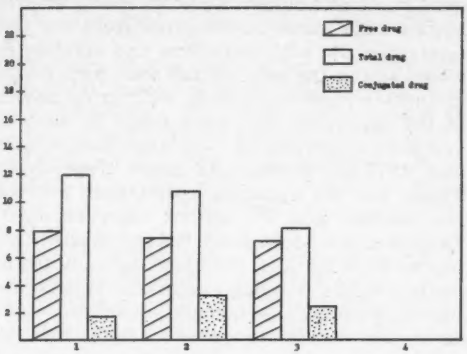
GRAPH III.—AVERAGE CONCENTRATION OF SULFAGUANIDINE IN THE BLOOD OF FOUR CHICKENS WHEN GIVEN AT THE RATE OF 1.0% IN WATER*

Numbers below the graph indicate days; at the left mg per 100cc of blood.

The sulfaguanidine concentration in the blood of chickens ranged between 3.04 and 5.97mg per 100cc, free drug, when a combination of sulfaguanidine and cerelose was administered at the rate of 1.0% in the drinking water. The total drug ranged between 3.91 and 8.82mg per 100cc of blood. Elimination was not complete, 24 hours after treatment, as was shown by the presence of a trace of sulfaguanidine in the blood. See graph III for details.

*Note: Sulfaguanidine 50% and cerelose 50%.

GRAPH IV.—AVERAGE CONCENTRATION OF SULFAGUANIDINE IN THE BLOOD OF FOUR CHICKENS WHEN GIVEN AT THE RATE OF 1.0% IN MASH



Numbers below the graph indicate days; at the left mg per 100cc of blood.

Sulfaguanidine administered at the rate of 1.0% in mash for three days reached an average blood concentration of from 7.16 to 7.98mg of the free drug per 100cc. The concentration of total sulfaguanidine present in the blood ranged from 8.13 to 11.97mg per 100cc. Unlike the sulfaguanidine and cerelose combination, sulfaguanidine was entirely eliminated one day after the discontinuance of treatment. See graph IV for details.

In experiment 8 the effect of different sulfonamides on cecal coccidiosis was compared. A presentation of the results appears in table I. The various sulfonamides given for two days, beginning 72 hours after inoculation, totally inhibited losses from cecal coccidiosis. The two infected untreated pens suffered 25% and 35% losses respectively. Although there

TABLE I.—THE EFFECT OF SULFONAMIDE ADMINISTRATION ON CECAL COCCIDIOSIS—EXPERIMENT 8*

Pen No.	No. of Chickens	Dosage	Average Wt. Gain Grams	Per Cent Mortality	Survivors with Gross Lesions of Cecal Coccidiosis None	Present	Gross Lesions in Spleen and Liver None	Present
1	20	2.0% sulfaguanidine and cerelose in drinking water	207	0	19	1	20	0
2	20	1.0% sulfaguanidine and cerelose in drinking water	189	0	18	2	18	2
3	20	0.4% sulfamethazine in mash	212	0	20	0	20	0
4	20	0.2% sulfamethazine in mash	185	0	20	0	15	5
5	20	0.15% chlorodiazine in mash	216	0	20	0	17	3
6	20	0.075% chlorodiazine in mash	231	0	19	1	15	5
7	20	1.0% sulfaguanidine in mash	229	0	20	0	17	3
8**	20	None	214	0	18	2	17	3
9	20	None	207	25†	14	0	14	0
10	20	None	188	35	12	1	13	0

*Treatment for two days, beginning at 72 hours after inoculation.
**Untreated, uninoculated control.
†Mortality was actually 30 per cent but only 25 per cent was due to coccidiosis.

were no losses from coccidiosis in the untreated, uninoculated control group, three birds with gross lesions in the liver or spleen were found at autopsy. No gross spleen or liver lesions were found in the birds from the pen receiving 2.0% sulfaguanidine and cerelose in water and in the pen treated with 0.4% sulfamethazine mash. Five birds with gross lesions in the spleen or liver were found in each of two pens, receiving 0.2% sulfamethazine mash and 0.075% chlorodiazine mash respectively. There was no apparent correlation between the dosages and the lesions observed. Some treated cases showed no lesions, while some lesions were found in the untreated, uninfected control chicks. Although no mortality was produced by a challenge inoculation with infective *E. tenella* oocysts two weeks after treatment

TABLE II.—THE EFFECT OF SULFAMETHAZINE ADMINISTRATION ON CECAL COCCIDIOSIS—EXPERIMENT 9

Pen No.	No. of Chickens	Dosage	Av. Wt. Gain Gm.	Per Cent Mortality
1	20	0.4% in mash one day	273	10*
2	20	0.4% in mash two days	251	0
3	20	0.4% in mash three days	253	0
4**	20	None	274	5*
5	20	None	238	15

*5% not due to coccidiosis.
**Untreated uninoculated controls.
All treatments were begun 72 hours after inoculation.

in any of the groups, two cases, with gross lesions of coccidiosis, were revealed at autopsy in the untreated uninoculated group. A study of the average weight gains did not reveal the drugs to have any significant inhibitory action on growth.

In experiment 9 the effect of sulfamethazine administration on birds infected with cecal coccidiosis was studied. The group of birds that received 0.4% sulfamethazine, in the mash for one day, suffered a 5% loss. Feeding a 0.4% sulfamethazine mash for two and three days, completely inhibited losses from cecal coccidiosis. All these treatments were begun 72 hours after inoculation. The untreated, infected control group suffered a 15% mortality. No significant difference was noticed in the average weight gains between the treated and untreated groups. No losses from cecal coccidiosis followed a challenge inoculation with infective *E. tenella* oocysts two weeks after treatment. See table II for tabulation of the results.

Experiment 10 was a repetition of experiment 9. Feeding a 0.4% sulfamethazine mash for one, two and three successive days following inoculation completely prevented losses from cecal coccidiosis in experimentally infected chicks. The group of birds that received 0.4% sulfamethazine mash for one day was found to have one case with a liver lesion and the chicks in the group receiving the same dosage for two days showed two cases of gross visceral lesions. The birds in the third pen were given a similar treatment for three days, but had no spleen or liver lesions. Four cases with gross visceral lesions were found among the chicks from the untreated, uninfected control pen. A challenge inoculation of the survivors with *E. tenella* oocysts two weeks after treatment caused no losses. See table III for a presentation of the results.

In experiment 11 the effect of different sulfonamides on cecal coccidiosis was studied. The drugs and dosages used were selected on the basis of the work in the previous experiments. Mortality was rather heavy in the treated pens. Some of the chicks died without partaking of the medicated mash (pens 1, 2, 3, and 4). It is conceivable that the death rate would have been much lower if the treatment had been started before the chicks were in the advanced stages of acute cecal coccidiosis. The group receiving 0.2% sulfamethazine in the mash for two days at the onset of symptoms of coccidiosis, suffered a 45% mortality. The feeding of a 0.15% chlorodiazine mash, for two days, after the appearance of bloody

TABLE III.—THE EFFECT OF SULFAMETHAZINE ADMINISTRATION ON CECAL COCCIDIOSIS—EXPERIMENT 10

Pen No.	No. of Chickens	Dosage	Average Wt. Gain Grams	Per Cent Mortality	Survivors with Gross Lesions of Cecal Coccidiosis		Gross Lesions in Spleen and Liver	
					None	Present	None	Present
1	20	0.4% sulfamethazine in mash 1 day	310	0	20	0	19	1
2	20	0.4% sulfamethazine in mash 2 days	334	0	19	1	18	2
3	20	0.4% sulfamethazine in mash 3 days	304	0	20	0	20	0
4*	20	None	338	0	19	1	16	4
5	20	None	310	30	14	0	14	0

All treatments were begun at 72 hours after infection.
*Untreated, uninfected controls.

droppings, resulted in a 30% mortality. The group receiving a two-day treatment of 1.0% sulfaguanidine mash upon the appearance of symptoms suffered a 30% mortality from cecal coccidiosis. The group receiving a 0.5% sulfamerazine mash at symptoms for two days had a 25% loss. A 5% loss in each of pens 3 and 4 was due to intestinal intussusception and ascites respectively. The untreated, uninfected birds showed no losses while the untreated, infected birds suffered a 30% mortality.

A comparison of the average weight gains in the different groups in experiment 11 does not reveal any marked variations. The lowest average weight gains were made by the birds receiving the 0.15% chlorodiazine mash and the 1.0% sulfaguanidine mash.

Post-mortem examination of the survivors in experiment 11, revealed a few chicks with gross lesions of cecal coccidiosis. Although the incidence was higher in the pens having high mortalities, two pens in which all the birds survived had one case each of gross cecal coccidiosis. There was no apparent relationship between the sulfonamides given and the incidence of gross liver or spleen lesions. One bird in the pen receiving 0.2% sulfamethazine in the mash and one chick in the group which was treated with 1.0% sulfaguanidine in the mash, displayed liver lesions. The chicks in the pens receiving 0.15% chlorodiazine and 0.5% sulfamerazine respectively in the mash showed no visceral lesions. Any significance that might be attached to these lesions, as related to sulfonamide therapy, tends to be dispelled, when it is considered that the untreated, uninfected control group was found to have four cases of gross liver or spleen lesions. See table IV for a detailed presentation of the results.

A challenge inoculation with sporulated *E. tenella* oocysts of all the survivors in experiment 11, two weeks after treatment, failed to produce any losses from cecal coccidiosis. This observation confirms similar findings in previous experiments, following a challenge inoculation.

The time of treatment appears to be a very important factor in the chemotherapy of cecal coccidiosis. All of the sulfonamides, that were used in these experiments, appear to be able to prevent losses from cecal coccidiosis, when treatment is begun early enough. To be beneficial, the therapeutic agent should be given before the chicks are too sick to eat and drink. A concentration of the particular drug, that is too high, may reduce palatability to the point where the intake will be less than if the concentration were lower.

All chickens inoculated were given 75,000 to 100,000 infective *Eimesia tenella* cocysts; illustration above x4.00.—Photo by Benbrook

Challenge inoculations of surviving chicks two weeks after treatment failed to produce any losses, indicating that the immunity mechanism was not disturbed by sulfonamide therapy. Of course, it must also be considered that the chicks were older at the time of reinfection and possibly not as susceptible to coccidiosis as they were earlier.

Summary

In one experiment, 80 Barred Plymouth Rock

TABLE IV.—THE EFFECT OF SULFONAMIDE ADMINISTRATION ON CECAL COCCIDIOSIS—EXPERIMENT 11

Pen No.	No. of Chickens	Dosage	Average Wt. Gain Grams	Per Cent Mortality	Survivors with Gross Lesions of Cecal Coccidiosis None	Present	Gross Lesions in Spleen and Liver None	Present
1	20	0.2% sulfamethazine mash at symptoms, 2 days	325	45	9	2	10	1
2	20	0.15% chlorodiazine mash at symptoms, 2 days	291	30	14	0	14	0
3	20	1.0% sulfaguanidine mash at symptoms, 2 days	270	35*	11	2	12	1
4	20	0.5% sulfamerazine mash at symptoms, 2 days	304	30*	14	0	14	0
5**	20	None	338	0	19	1	16	4
6	20	None	310	30	14	0	14	0

*5% not due to coccidiosis.
**Untreated, uninfected controls.

chicks were used to determine the sulfonamide blood level resulting from various dosages. In four other experiments, 520 Barred Plymouth Rock chicks were employed in studying the effect of sulfonamides on cecal coccidiosis.

Average weight gains, mortality percentage, and the incidence of gross visceral lesions were criteria used in determining the therapeutic value of each drug.

The average blood concentrations of the different sulfonamides during a three-day treatment were as follows:

0.4% sulfamethazine in mash, 14.55mg free drug per 100cc.

0.15% chlorodiazine in mash, 8.00mg free drug per 100cc.

1.0% sulfaguanidine and cerelose in water, 4.50mg free drug per 100cc.

1.0% sulfaguanidine in mash, 7.57mg free drug per 100cc.

Average weight gains did not appear to be significantly affected under sulfonamide therapy. Cecal coccidiosis appeared to have a depressing effect on the growth rate.

Concentrations of 0.2% and 0.4% sulfamethazine in the mash and 0.15% chlorodiazine in mash given for two days, beginning 72 hours after infection prevented losses from cecal coccidiosis. Giving 1.0% sulfaguanidine and cerelose in the drinking water or 1.0% sulfaguanidine in mash for two days, beginning 72 hours after inoculation, gave very favorable results.

No apparent relationship was observed between the use of sulfonamides and the incidence of gross liver or spleen lesions.

The time of treatment appears to be a very important factor in the chemotherapy of cecal coccidiosis. For most favorable results, the therapeutic agent should be given before the chicks are too sick to eat and drink.

Challenge inoculations of survivors with infective *E. tenella* oocysts two weeks after treatment did not result in losses, showing that the development of immunity was not affected.

If weather is rainy treatment of coccidiosis is less effective

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Germicidal Action of Certain Chemicals on the Virus of Newcastle Disease (Avian Pneumoencephalitis)

By F. W. TILLEY* and W. A. ANDERSON*
Washington, D. C.

THE control of Newcastle disease has recently become of great importance to the poultry industry of this country. Because of the need for information on this subject, a conference was called by the Bureau of Animal Industry, U. S. Department of Agriculture at Baltimore, Md., on November 18-20, 1946. The purpose of this conference was to organize a nationwide coordinated program of research. At the meeting several committees were appointed to plan various phases of this program. One of these, the committee on the virus and its properties, recommended that investigations be conducted to determine the effectiveness of disinfectants and disinfecting procedures in the destruction of Newcastle disease virus. The Bureau of Animal Industry undertook part of this work, and a number of disinfectants were selected as having possible value. Studies with these have progressed sufficiently to permit a preliminary report on their effectiveness under laboratory conditions.

A strain of virus designated as T3L[4] was used in the experiments. This strain was isolated in January, 1947, from lung tissue obtained from a natural outbreak in chickens. Amnio-allantoic fluid obtained from the fourth embryo passage was used as virus material. Portions of it were stored at —70° C. and taken out as needed.

Eleven-day embryonating eggs were used in each experiment. A small opening over the air sac was made with an electric vibrating drill, the point of drilling having been first disinfected with tincture of iodine. Injections were made through the chorio-allantoic membrane with a 27-gauge, ⅝-inch needle. The point of injection was closed with sealing wax. The eggs were then candled daily for seven days. Any deaths occurring during the first 24 hours were considered to be due to injury rather than to virus multiplication. Incubation was at 100° F. in an electric forced-draft incubator.

To determine the effectiveness of a disinfectant, equal volumes of disinfectant and virus were mixed and the mixture held in a water bath at 20° C. At the end of 5, 15, 30 and 60 minutes of exposure 1cc of the mixture was removed and added to sterile distilled water, the volume of which is shown for each product in the table. One cubic centimeter of the final dilution was then transferred to a test tube and used for inoculation of embryonating eggs. The amount inoculated was 0.1cc per egg. The concentration of the virus was determined for each experiment and in each experiment the embryo m.l.d. was 0.1cc of a 10^{-7} or 10^{-8} dilution.

In each experiment disinfectant controls were run by mixing equal volumes of disinfectant and normal allantoic fluid and these control mixtures were held in the water bath for the maximum length of time that the corresponding disinfectant-virus mixtures were held. At that time 1cc of the control mixture was removed and diluted with sterile distilled water in the amount shown in the table for each disinfectant.

Virus controls were run by mixing equal volumes of virus and sterile distilled water and holding in the water bath until after the final exposure period for disinfectant and virus. At that time 1cc of the mixture was removed and diluted with sterile distilled water, the amount used being the greatest used in that particular experiment and the maximum amount in any experiment being 200cc. The number of eggs inoculated in each experiment was four for each period of exposure for each disinfectant and four for each disinfectant control. In each experiment six eggs were used for the virus controls. Since death occurred in every instance with these controls, the results are not included in table I.

Discussion

A series of tests were made to determine, under laboratory conditions, the effectiveness of the following disinfectants against the virus causing Newcastle disease: sodium hydroxide, sodium orthophenylphenate, liquor cresolis saponatus, phenol, formalin, isopropyl alcohol, ethylene glycol, sodium carbonate, a calcium hypochlorite disinfectant of low alkalinity, a sodium hypochlorite disinfectant of

*Pathological Division, Bureau of Animal Industry, Agricultural Research Administration, U. S. Department of Agriculture, Washington 25, D. C.

high alkalinity, and two different quaternary ammonium disinfectants.

Under the conditions of this test, as determined by embryo survival for seven days following inoculation, it appears that the following disinfectants would be effective against this virus: sodium hydroxide, 2% solution; sodium orthophenylphenate, 1% solution; liquor cresolis saponatus U.S.P., 1% solution; and quaternary ammonium compounds numbers 1 and 2, 0.1% solution.

The calcium hypochlorite solution of low alkalinity was effective in a solution of 400 parts per million, whereas in the same dilution, the sodium hypochlorite solution of high alkalinity failed to inactivate the virus. The results obtained with the two hypochlorite solutions show the importance of pH as a factor in their germicidal action, as pointed out elsewhere by Tilley and Chapin.[1]

Formalin in 4% solution failed to inactivate the virus after 30 minutes, but was effective in 60 minutes. Formalin, therefore, appears to require considerable time to destroy the virus.

Under the conditions of these tests, the following disinfectants appeared to be ineffective against Newcastle disease virus: isopropyl alcohol, 50% solution; ethylene glycol, 100%; and sodium carbonate, 4%.

TABLE I.—RESULTS OF INOCULATION OF EGGS WITH MIXTURES OF DISINFECTANTS AND NEWCASTLE DISEASE VIRUS

Kind of disinfectant	Concentration of disinfectant		Final dilution of mixture	Results of egg inoculations (embryo survival and mortality) with virus exposed to disinfectant for periods indicated												Disinfectant alone
				5 minutes			15 minutes			30 minutes			60 minutes			
	Initial	Final		No. Survived	No. dead	Day of death	No. Survived	No. dead	Day of death	No. Survived	No. dead	Day of death	No. Survived	No. dead	Day of death	No. Survived
	Percent	Percent														
Sodium Orthophenylphenate	1.0	0.5	1:50	4	0		4	0		4	0		4	0		4
Sodium Hydroxide	1.0	0.5	1:50	0	4	3	0	4	3	0	4	3	0	3 1	3 4	4
Sodium Hydroxide	2.0	1.0	1:100	4	0		2	1 1	4 7	3	1	4	3	1	5	4
Quaternary (1) Ammonium Compound No.1	0.1	0.05	1:50	4	0		3	1	3	4	0		3	1	5	4
Quaternary (2) Ammonium Compound No.2	0.1	0.05	1:50	4	0		4.0			4	0		4	0		4
Liquor Cresolis Saponatus	1.0	0.5	1:50	3	1	4	3	1	2	4	0		4	0		4
Phenol	2.0	1.0	1:50	0	4	3	0	3 1	3 4	0	3 1	3 4	0	3 1	3 4	4
Phenol	4.0	2.0	1:100	3	1	4	4	0		4	0		4	0		4
Formalin	2.0	1.0	1:200	0	4	3	0	4	3	0	4	3	0	4	7	4
Formalin	4.0	2.0	1:200	0	4	3	0	3 1	3 6	0	4	6	3	1	7	4
Isopropyl Alcohol	50	25	1:50	0	4	3	0	4	3	0	4	3	0	4	3	4
Ethylene Glycol	100	50	1:50	0	4	2	0	4	2	0	4	2	0	4	2	4
Sodium Carbonate	4.0	2.0	1:50	0	2 2	2 3	0	4	3	0	1 3	2 3	0	4	3	4
Calcium Hypochlorite	Available chlorine P.P.M. 100	P.P.M. 50	1:50	0	4	2	0	4	2	0	1 2 1	1 2 3	0	2 2	2 3	4
Calcium (3) Hypochlorite	200	100	1:50	0	1 3	2 3	0	4	3	0	4	3	0	1 3	1 3	4
Calcium Hypochlorite	400	200	1:100	4	0		4	0		4	0		4	0		4
Sodium (4) Hypochlorite	200	100	1:50	0	4	3	0	2 2	2 3	0	4	2	0	2 2	2 3	4
Sodium Hypochlorite	400	200	1:100	0	4	3	0	4	3	0	4	3	0	4	3	4

1. High molecular alkyldimethyl benzyl ammonium chlorides.
2. Para tertiary octyl phenoxy ethoxyethyl dimethyl benzyl ammonium chloride monohydrate.
3. pH of calcium hypochlorite 200 ppm=8.25.
4. pH of sodium hypochlorite 200 ppm=11.4.

[1] Tilley, F. W. and Chapin, R. M. Germicidal efficiency of chlorine and N-chloro derivatives of ammonia, Methylamine and glycine against anthrax spores. *J. Bacteriol*, 19:4, pp. 295-302. 1930.

Clinical Reports

Variant Lesions of Blackleg

The eliology and control of blackleg are both known to the veterinarian but, because this disease is an ever-present threat to livestock health, he should be able to diagnose it clinically, in all its forms.

Many observers have noted that the lesions are usually located upon and extend over the greater part of a hind quarter or shoulder. A review of the clinical records discloses that, at times, the lesions are found in unusual anatomical locations. A brief resumé of the post-mortem pathological findings in several cases illustrated the occurrence of these unusual forms and should aid in field diagnosis of atypical cases.

A yearling Hereford steer was examined, post-mortem in August, 1946. There were slight lesions of the myocardium and extensive involvement of the pectoral muscles and the muscles of the lateral wall of the thorax. A considerable quantity of brown-colored exudate escaped when the pleural cavity and the pericardial sac were opened. Portions of the lungs were soggy and filled with this bloody exudate. The disease proved, on laboratory tests, to be blackleg.

Another was a case in a calf, about six months of age and in good condition. It was brought into the clinic in September, 1946. A diagnosis was not made immediately. A calf from this herd had died about a week previously from an unrecognized cause. Two other calves from this herd were examined post-mortem several hours after they had died and no macroscapic lesions were found except in the tongue and submaxillary region. The contents of the rumen and omasum were unusually dry. While the necropsy was in progress on these two calves another calf in this herd displayed respiratory distress and marked depression. This last calf died about 12 hours later and on necropsy revealed typical lesions of blackleg. There was marked involvement of the pectoral muscles, extensive swelling of the submaxillary space and tongue, and characteristic emphysematous processes. All five of these calves had been vaccinated by the owner with a Chauvoei-septicus bacterin in the latter part of April, before being turned into a large upland pasture where they evidently contracted the infection.

In another outbreak of blackleg, one of five dead calves was examined. They, too, were reported to have been layman vaccinated in the spring and again about a week before the deaths occurred; Chauvoei-septicus bacterin being used. No lesions could be found by palpation of the surface of the body but, on post-mortem examination, characteristic blackleg lesions were found in the tongue, intercostal muscles, heart and diaphragm.

While the lesions produced in a blackleg infection do not differ, it may be seen from these pathological findings that they vary considerably in location, *e.g.*, heart, tongue, intercostal muscles and elsewhere. This should be taken into account when diagnosing apparent Clostridium infections.

One other pitfall in diagnosing blackleg may be mentioned in passing. Don't expect the disease to occur *only* in calves. Feeder steers go into the feedlots when quite young these days; at just about the right time to have lost their immuniy from vaccination, but not old enough to have acquired the age immunity of mature cattle. One should be on the alert for blackleg in the case of "mysterious" deaths in the feed lot.

CARL E. REDFIELD

Warner, S. D.

* * * *

Multiple Tumors in a Dog

July 15, 1946, a ten-year-old, pointer bitch was brought in for treatment of a growth on the medial surface of the right elbow.

Examination of this bitch showed that there was involvement of the right prescapular lymph gland and a mammary gland carcinoma in addition to the tumor about which the owner was concerned.

She was given three grains of nembutal *per os* and the areas around the elbow growth and prescapular lymph gland were infiltrated with 2% procaine hydrochloride. The growth on the medial surface of the right elbow was approximately two inches across at its base and protruded 1.5 inches. It was easily dissected out. Sectioning and miscroscopic examination revealed it to be a granulomatous keloid-like growth. The right prescapular lymph gland was also dissected out.

The following day three grains of nembutal were administered *per os* and the area around the mammary gland carcinoma was infiltrated with 2% procaine. The carcinoma and involved gland were excised. It was found that there were three fatty growths adjacent to the involved mammary gland. These were also removed and later proved to be typical lipomas. There was also a lipoma on the right lateral surface of the thoracic wall just posterior to the shoulder. It was subcutaneous and was removed.

All operative areas healed nicely and the dog was discharged. She was brought in for re-examination a month later and it was found

that the mammary gland carcinoma was recurring. It was recommended to the owner that he use her for hunting during the coming season and then consider euthanasia.

Since an examination of the available literature indicates that the simultaneous occurrence of different kinds of tumors in dogs is uncommon, this case, in which three different kinds of tumors were present at the same time, seems worth recording.

HOWARD RONK

Twin Falls, Idaho.

Chronic Otitis Media in a Dog

A four-year-old, black, male Cocker Spaniel was presented at the clinic for examination January 8, 1947. There was a history of a chronic discharge from both ears since early September. The dog had previously been hospitalized by two veterinarians.

The dog had a good appetite and was bright and alert; the temperature being 101.2° F. He would shake his head constantly and there was a discharge from both ears. The dog evidenced only slight sensitiveness about the ears and ear canals. A diagnosis of chronic otitis media was made. The prognosis was favorable.

An operation for drainage of the external ear canal was performed. The operative area was shaved, painted with tincture of iodine and then covered with an alcoholic sublimate pack. A local anesthetic of 2% procaine hydrochloride was infiltrated into the tissues in the operative area. A pair of forceps was then introduced into the external ear canal to the point where the canal turns inward. A scalpel was used to cut the tissues along side of the forceps, so as to remove a V-shaped piece of tissue to which the forceps had been attached. The mucous membrane lining the ear canal and the skin were sutured together, using interrupted sutures of braided silk. The purpose of the operation was to allow good drainage and to permit free passage of air into the ear canal.

A sulfanilamide pack was applied to the wound and covered with a stockinette bandage. Further after care consisted of cleaning the wound daily, applying fresh sulfanilamide powder and cleaning and drying the ear canals. The ears were taped together over the head to allow plenty of air to get to the wound, and to prevent them from flopping when the dog shook his head. January 16, the sulfanilamide therapy was discontinued and penicillin ointment was substituted for it.

January 23, the dog was discharged from the hospital as recovered. His hearing was apparently not affected by the condition.

This operation frequently salvages dogs affected with otitis media that fail to respond to other methods of treatment. It takes very little time to perform this operation; it is quite simple and there is little danger to the patient.

DONALD G. LOW

Denver, Colorado.

Recovery from Leptospirosis

January 17, 1947, a parti-colored cocker spaniel six and one-half months of age was presented for treatment.

The history was of an illness beginning a week previously. The dog had received the third injection of distemper vaccine the day before becoming ill. When the animal was noticed to be ailing, it was taken to a veterinarian who gave it vitamins and said it was not very sick. The dog had been vomiting and refusing to eat for several days.

The symptoms observed upon examination were extreme depression, dehydration, anorexia, congested oral and ocular mucous membranes, hemorrhagic gingivitis, labored breathing, a purulent nasal discharge, and pain on palpation over the kidneys. The temperature was 102° F., the pulse 120, and the respiration 24 per minute. Upon auscultation, rales could be heard in the lungs. Plainly the dog was almost if not quite moribund.

A diagnosis was made of leptospirosis with a secondary generalized bilateral pneumonia. The leptospirosis had entered the second, or toxic stage. Because under older lines of treatment such cases invariably terminated fatally and because of the satisfactory outcome of this case, under sulfathiazole, sulfapyridine and penicillin and supportive treatment, the medication including the supportive treatment is given in great detail.

The treatment given was as follows:

January 17th.—3:00 p.m. intravenously—25,000 units of penicillin, 10cc Pitman Moore bio serum 656, 10cc leptospirosis antiserum, 1cc liver extract, 25 grains sodium sulfapyridine, and qs. 100cc 5% dextrose. In addition a sodium biocarbonate clyster was given.

6:00 p.m. and 10:00 p.m.—25,000 units penicillin intramuscularly and 0.5cc liver extract intramuscularly.

January 18th.—8:00 a.m. same as 10:00 p.m. preceding day.

11:00 a.m.— 15,000 units penicillin and 1/100 grain atropine sulfate intramuscularly, 25 grains sodium sulfapyridine, 20cc of 25% dextrose solution and 80cc physiologic saline solution intravenously.

2:00 p.m.—20,000 units penicillin, 0.5cc liver extract, 15 grains sodium sulfapyridine, and 100cc of 25% dextrose solution intravenously in normal saline solution.

6:00 p.m. and 10:00 p.m.—15,000 units penicillin and 1/100 grain atropine sulfate intramuscularly.

January 19th.—8:00 a.m. and 11:00 a.m. same as 10 p.m. the preceding day.

3:00 p.m.—15,000 units penicillin intramuscularly, 7.7 grains sulfathiazole and one No. 1 tablet of triple arsenates with nuclein (Abbott) were given *per os.*

6:00 p.m. and 10:00 p.m.—15,000 units penicillin intramuscularly and 1/100 grain atropine, subcutaneously, 15 grains sulfathiazole and one No. 1 tablet of triple arsenates *per os.*

January 20th.—8:00 a.m. 15,000 grains penicillin and 1/100 grain atropine intramuscularly.

2:00 p.m.—15 grains sodium sulfapyridine, 10cc leptospirosis antiserum, 10cc p.m. Bio. serum 656, 20,000 units penicillin, 1cc liver extract, and qs. 100cc 5% dextrose intravenously. 1/100 grain of atropine sulfate was given subcutaneously. 20cc pervinal (U. S. Vitamin Corp.) and one No. 1 tablet of triple arsenates were given *per os.*

6:00 p.m.—10,000 units penicillin intramuscularly and 7.7 grains of sulfathiazole *per os.*

10:00 p.m.—Same as preceding treatment, plus 1/100 grain of atropine sulfate subcutaneously, one No. 1 tablet of triple arsenates *per os.*

January 21st.—8:00 a.m. Same as 10:00 p.m. preceding.

2:00 p.m.—Same as 10 p.m. preceding, plus 1cc liver extract subcutaneously and 20cc pervinal *per os.*

6:00 p.m.—10,000 units penicillin intramuscularly and 7.7 grains of sulfathiazole *per os.*

10:00 p.m.—Same as the 6:00 p.m. treatment preceding plus one No. 1 tablet of triple arsenates *per os.*

January 22nd.—8:00 a.m. Same as 10:00 p.m. preceding.

2:00 p.m.—Two tablets, canine expectorant (Fort Dodge), 7.7 grains sulfathiazole, 10cc pervinal, and one No. 1 tablet of triple arsenates *per os,* 10,000 units penicillin intramuscularly.

6:00 and 10:00 p.m.—3.85 grains sulfathiazole, one No. 1 tablet of triple arsenates and one tablet, canine expectorant *per os.*

January 23rd.—8:00 a.m. Same as 10.00 p.m. preceding.

2:00 p.m.—One tablet, canine expectorant, 10 grains methenamine, one No. 1 tablet of triple arsenates and one B and iron tablet and 50,000 units of vitamin A *per os.*

8:00 p.m.—One tablet, canine expectorant and one No. 1 tablet of triple arsenates.

January 24th.—8:00 a.m. Same as 8:00 p.m. preceding.

1:00 p.m.—50,000 units vitamin A, 5 grains methenamine, one tablet canine expectorant, and one No. 1 tablet of triple arsenates *per os.*

8:00 p.m.—One tablet canine expectorant and one No. 1 tablet of triple arsenates.

Camphorated oil was rubbed on the chest at 10:00 p.m. each day of treatment.

At no time did the temperature exceed 102.2° F. On the third day of treatment the dog began eating. After the fifth day, the dyspnea was alleviated and there was no depression. January 25th, the animal was very lively and well on its way to recovery, and treatment was discontinued.

While the sulfa drugs and penicillin are given the major credit for the cure in this case, it is thought the liver extract, vitamins and sera were probably helpful as was also the supportive treatment, the dextrose, saline solution and iron quinine and strychnine arsenate, all were indicated by the condition of the animal at the time, and were undoubtedly helpful.

This case exhibited a near miraculous recovery, as it was very near death when presented. It illustrates the importance of a correct diagnosis and patient and persistent treatment in leptospirosis. It could easily have been mistaken for distemper.

J. C. HUBBS

Dorrance, Kan.

Squamous Cell Carcinoma in the Dog

A two-year-old, spayed pointer was brought to the clinic Nov. 4, 1946. The dog had a large mass of neoplastic appearing tissue that involved most of the region of the left flank. The owner had first noticed the condition about three months previously. Since then the growth had been rapid. Necrosis of several portions of the mass had occurred. The suppurating areas had been incised in the hope that healing would occur.

The squamous cell carcinoma after removal

There was suppuration at several points within the mass and a red serum-like exudate appeared when pressure was applied. There was no evidence of a systemic involvement and the animal was in fine condition. She had been used in the field but constantly licked at her flank and was useless for hunting purposes.

The areas of suppuration were treated by the direct injection of penicillin into the mass in preparation for later surgical removal. It was thought that the condition may have been due to an unabsorbed piece of suture within the abdominal cavity, with a resulting fistulous tract opening to the outside. An exploratory laparotomy was performed but no adhesions were present in the ventral abdominal area. However, there were extensive adhesions to the peritoneum of the left flank, indicating that the flank had been the site of the oophorohysterectomy. There was no evidence of involvement of the peritoneal cavity or the viscera by the neoplastic tissue.

November sixth the neoplasm was removed under general anesthesia. There was extensive involvement of the subcutaneous tissue, but the muscles were not affected. Two small pieces of unabsorbed suture material were discovered within the mass during the operation. The skin incisions were closed with a vertical mattress type suture and a dressing applied. One hundred cubic centimeters of 5% dextrose in saline solution was given intravenously and 1cc of adrenaline was injected subcutaneously.

The neoplasm was sectioned and examined microscopically. The epithelial cells were embryonic in appearance, as shown by their large size and the presence of a great many mitotic figures. The cells appeared in large groups with very little admixture of stroma. The neoplasm was classified as a squamous-cell carcinoma.

The dog made an uneventful recovery and was discharged from the clinic on November tenth. Six weeks later the owner reported that the incision had healed nicely and there were no indications of recurrence.

J. W. BARRY

Kansas City, Kan.

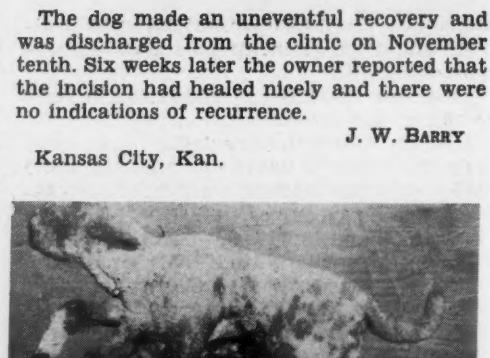


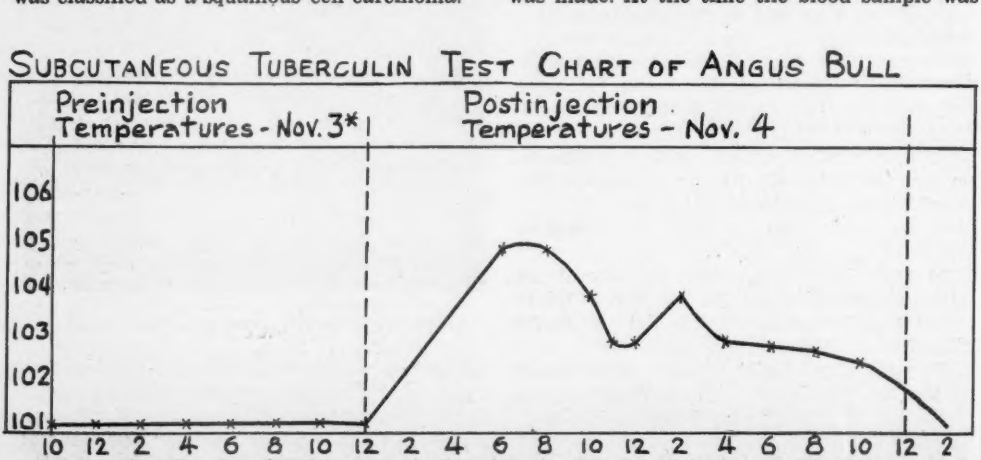
Illustration of an eight-legged lamb sent by Dr. M. L. Bujan, Camby, Ind.

Tubercular Orchitis in a Bull

October 29, 1946, an Angus bull was presented for a sterility examination. He had not served a cow for several weeks and had been unable to settle a cow for some time prior to that. The herdsman disclosed that the bull's scrotum had been swollen for a month or longer. Hot packs had been applied periodically with no apparent improvement of the condition.

Upon examination by palpation, the condition was tentatively diagnosed as an orchitis was made. At the time the blood sample was

SUBCUTANEOUS TUBERCULIN TEST CHART OF ANGUS BULL



taken, an intradermal injection of tuberculin involving primarily the median septum of the scrotum.

Suspecting brucellosis infection, a blood test was given as a further check. The brucellosis test proved completely negative, but 24 hours after injection of the tuberculin in the left caudal fold, there was a noticeable swelling at the site of injection. At 48 hours the swelling was very pronounced, being approximately as large as a hen egg of average size. At 72 hours, the swelling had completely obliterated the caudal fold and was very sensitive. The animal was feverish, and was declared to be, definitely, a reactor, notwithstanding he had been reported negative to an intradermal tuberculin test just a month previously.

Having heard much discussion concerning the thermal tuberculin test and its resultant rainbow temperature curve, there was the desire to conduct a test for experience, also a check on the intradermal test.

November 3, 1946, five preinjection temperatures were taken at four-hour intervals. These temperatures were checked with two thermometers. At the time of the fifth preinjection temperature reading, 3cc of tuberculin was injected subcutaneously in the region of the neck. The accompanying chart gives the results of the test. All temperatures were checked with two thermometers. As the accompanying chart shows, a typical rainbow curve occurred as the temperature readings were taken.

Subsequently, the animal was tagged, branded, and shipped to market for slaughter. At slaughter, the scrotum and tissues adjacent to the scrotum were removed "in toto" for examination. The accompanying illustration depicts the lesions as follows: The superficial inguinal lymph glands (No. 1) were found to be enlarged and when incised, disclosed typical caseated and calcified lesions of tuberculosis. The scrotum was then opened carefully, an incision being made in the midline. A large well encapsulated abscess (No. 2) was exposed which contained a thick creamy pus. Against this cream-colored material, minute white caseous particles or masses could be seen. These small caseous masses were present in great numbers. The connective tissue capsule surrounding the abscess was an inch to an inch and a half in thickness. The testes (No. 3) apparently were not involved as they were of normal size and appearance. Calcified lesions were also found in the right precrural lymph gland (No. 4). No further lesions were found in a careful examination of the whole of the carcass. Visceral, body, and other lymph glands, other than those mentioned as being involved, showed no lesions whatsoever.

Smears were made from material taken from the abscess (No. 2) and stained with acid-fast staining technic. Microscopic examination disclosed typical acid-fast rod shaped organisms. Culturing and animal inoculation were considered unnecessary.

It is quite apparent that the sterility of this bull was due to the high temperature of the scrotum resulting from abscess formation in the median septum. This animal would eventually have gone to slaughter even though a tuberculin test had not been made since a sterile bull is good only for baloney. This case is an excellent example of the necessity for the veterinarian to use his knowledge and skill in diagnosis and diagnostic methods to the utmost. A wrong diagnosis may be a costly mistake in some cases.

Why did this bull react to the thermal but not to the intradermal test? The answer condemns the first tester.

R. G. CHERRY

Redwood Falls, Minn.

Abstracts

Gonadotropin Accelerates Reproduction in Sows

Twenty-six of 27 sows[25] injected with 750-1,500 I.U. pregnant mare's serum gonadotropin between the 39th and 68th day of lactation came into estrus three to seven days after the injection. All the sows were mated and of 20 on which further information was available 19 became pregnant. The size of the litters and the duration of pregnancy appeared normal.

Of 15 sows injected with gonadotropin between the first and the 38th day of lactation, only four, injected on the second, 30th, 35th and 38th days, came into estrus. One of these sows became pregnant.

Of seven control sows, one came into estrus on the 66th day of lactation.

It is concluded that the time between successive farrowing could be shortened by two to four weeks by the use of the serum on or after the 40th day of lactation.

Equine Anesthesia

The author[27] in his work as anesthetist and later officer in charge of muting mules for the military operations in Burma in 1943 and 1944 anesthetized or observed the anesthetization of 2000 mules in which chloral hydrate was used and 2400 mules in which chloroform was the anesthetic employed.

The chloral hydrate was given intravenously, feed having been withheld from the animals the previous night and morning, *i.e.*, the last preceding feeding was 18 to 24 hours before the operation. The dose was 5.5gm per 100 pounds body weight, but since the weight of the animals was estimated it is thought many of them may have received 6gm per cwt. "Not more than 5% were truly anesthetized. The remainder were reduced to varying states of narcosis." Which amounts to saying this large dose of chloral hydrate was a means of surgical restraint rather than of surgical relaxation.

The author's "predominating impression" from this large experience in the use of chloral "was the tremendous amount of idiosyncrasy to be observed in animals of the same breed, shape, and approximate weight." "We recorded something like a dozen cases in which animals recovering from narcosis after being operated upon lay recumbent for periods varying from 15 to 40 minutes, then struggled to their feet, walked off the operating bed a distance of 10 to 15 paces and dropped to the ground." The heart beats were undetectable after 30 seconds and respiration ceased in 60 to 90 seconds.

The dosage given in the foregoing was employed on 1500 mules. Later a dosage of 4gm per cwt. was used on 500 mules. In this series idiosyncrasies are not mentioned.

Of the 2400 animals anesthetized with chloroform but two died as a result of the anesthesia. In both instances the directions to fast the animals had been disregarded; both mules receiving the evening and morning feeds immediately preceding the operations.

Only a light stage of chloroform anesthesia was induced; corresponding to medium chloral narcosis.

Dropsy in Ayrshire Cattle

This defect[7] consisted of generalized anasarca and ascites in newborn calves, which died soon after birth. The trouble was traced to a bull which on mating with his sisters and daughters produced a proportion of calves affected with dropsy.

The genetical features are described fully. J. E.

Milk-Borne Outbreak of Salmonellosis

An outbreak[26] of gastroenteritis in Yorkshire, England, involved 79 families and 162 individuals. Because all obtained milk from the same dairy, it was suspected and on investigation one cow was found discharging vast numbers of *S. dublin* in the feces.

The animal was purchased and taken to the laboratory of the Ministry of Agriculture and Fisheries at Weybridge where it was kept under observation for seven months. During the whole period the cow appeared to be in normal health and gave a normal flow of milk. The heavy fecal contamination with Salmonella continued throughout the period.

Milk collected by ordinary milking sometimes contained the same organism, undoubtedly from fecal contamination, but when collected with care through a milking tube after first washing the udder and sterilizing the end of the teat it was in no instance infected with Salmonella.

At necropsy the only lesions found were of chronic inflammation of the gall cyst, the walls of which were 1cm thick. *S. dublin* was present in the gall bladder in pure culture but was found nowhere else in the carcass except in the lumen of the intestine.

[25] Cole, H. H., and Hughes, E. H. Induction of estrus in lactating sows with equine gonadotropin. *J. Anim. Sci.*, 5, pp. 25-29. 1946. Abst. in *Vet. Bul.*, 17:1, p. 36. 1947.

[27] Foster, A. E. Carey. Equine Anesthesia. *Vet. Rec.*, 59:1, pp. 3-4. 1947.

[7] On the occurrence of dropsy in Ayrshire cattle in Finland. (Trans Title), Korkman N., Abst. *Vet. Bul.*, 16:10, p. 358. 1946. *Nord. FordbrForskn*, 22, pp. 225-243. 1940.

[26] Rankin, J. Deans and Slavin, G. *Salmonella enteritidis* var. *dublin* infection in a cow resulting in an outbreak of human gastroenteritis. *Vet. Rec.*, 59:9, pp. 122-124. 1947.

Book Reviews

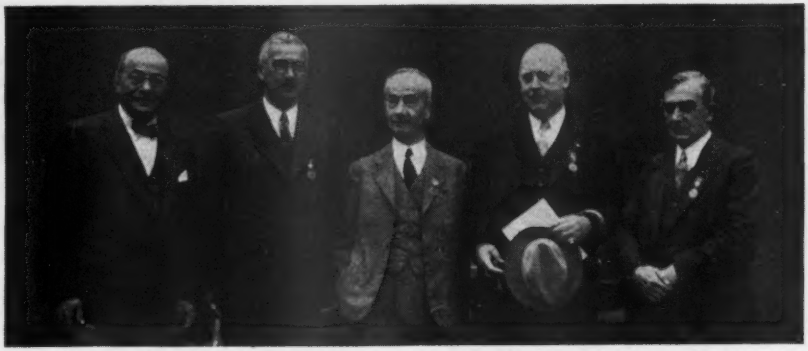
Special Pathology and Therapeutics of the Diseases of Domestic Animals.—By *Dr. Franz Hutyra,* late Professor of Infectious Diseases at the Ancient Royal Veterinary College, *Dr. Joseph Marek,* late Professor of Special Pathology and Therapy at the Royal Hungarian Palatin-Joseph University, and *Dr. Rudolph Manninger,* Professor of Infectious Diseases at the Royal Hungarian Palatin-Joseph University. Edited by *J. Russel Greig,* C.B.E., Ph.D., M.R.C.V.S., F.R.S.E., Director Moredum Research Institute, Hon. Professor in Animal Pathology, Royal (Dick) Veterinary College. With the collaboration of *John R. Mohler,* V.M.D., D.Sc., former chief of the Bureau of Animal Industry, USDA and *Adolph Eichhorn,* D.V.S., former chief of the Pathological Division, Bureau of Animal Industry, USDA. Fifth English edition. Three volumes, 2428 pages, 725 illustrations and a number of color plates. Alexander Eger, Inc., Chicago, 1946. Price $50.00.

That "Hutyra and Marek" is again available is news, welcome news, in veterinary circles. This work has been accepted for a generation as the outstanding publication dealing with the diseases of animals and an interruption of the supply over a periof of several years caused no little inconvenience to schools, practitioners, research workers and others in the veterinary field.

This edition like the fourth was published in London. It was advanced because of the destruction, by enemy action, of the entire stock of the work remaining in possession of the publisher at the time of the "blitz." This edition was prepared in the face of great difficulties for the editor, the publisher and the printer. The changes are of a minor nature and not comparable with the thorough-going revision published 10 years ago. Printed on lighter paper the volumes appear smaller, but they contain the same number of pages as in the preceding edition.

That the text more nearly reflects veterinary science of a decade ago than of the present is evident in many places. Therapy discussions do not include the sulfonamides, phenothiazine is mentioned but not the phenothiazine-salt mixture. Nor are penicillin and other antibiotic agents; DDT, gammexane, etc. The use of sulfamethazine in coccidiosis of chicks, a development of 1942, is not mentioned. By contrast the discussion of equine encephalomyelitis is brought down to 1943 or 44.

In discussing brucellosis, "strain 19" vaccine is not mentioned but is referred to as a strain of slight pathogenicity. The first experiment in calf vaccination is mentioned as being under way but the results published in 1940 are not given. Vaccination as means of preventing brucellosis is discussed with the statement: "In a herd inoculated with living cultures eradication of the infection is impossible." This statement refers to inoculation with virulent cultures which, in this country, was discontinued long before the preceding edition of Hutyra and Marek was published.



AUTHORS, COLLABORATORS AND EDITOR OF "HUTYRA AND MAREK"
Left to right: Dr. A. Eichhorn, collaborator; Prof. Dr. Rudolph Manninger, co-author; Prof. Dr. Joseph Marek, co-author; Dr. John R. Mohler, collaborator, and Dr. J. Russell Greig, editor-in-chief

The text on rabies is another example of outmoding. It states, "The value of protective immunization in the control of rabies is still very doubtful." The work of Barnes and Lentz indicating rabies vaccine is without value is given equal prominence with experiments showing its value. The outstanding Rockefeller research at Montgomery, Alabama, is not mentioned. The suppression of outbreaks of the disease by vaccination in this country over a long period is not mentioned nor is the Habel potency test for the vaccine. This somewhat astonishing statement occurs: "As regards susceptibility to rabies there are no particular differences between the various species of mammals." The accepted opinion on this matter seems to be that in ruminants exposure

results in infection in practically 100% of the cases, whereas in man only a minority of the untreated exposures result in development of the disease and the susceptibility of dogs falls between that of ruminants and man.

In the case of tetanus it is stated: "The possibility of producing active immunity in domestic animals against tetanus rests upon the results of laboratory experiments." Yet as early as the spring of 1941 the value of tetanus toxoid was sufficiently recognized, that all horses and mules belonging to the U. S. Army were immunized with it. Throughout the war millions of soldiers were given the toxoid and thereby thousands of lives were saved.

The foregoing is mentioned with no thought of implying criticism of the editor or the publisher of the fifth edition of this work. That they had the fortitude to go through with the task at all in the face of the very great difficulties that obtained in London and throughout the British Islands during the war and since is deserving of every commendation. Nor is there any implication that the work is not, as it has been through all four preceding editions, the outstanding textbook on diseases of animals. The aim is (1) to inform prospective purchasers what to expect that they may not be disappointed and (2) perhaps to induce owners of copies of the fourth edition of Hutyra and Marek to allow those who do not possess copies an opportunity to obtain them first.

Because of the acute paper shortage in Britain but a small number could be printed and of these only half were allotted to the United States. It is quite likely that the number available to American purchasers will be insufficient to supply the immediate demand.

Book Review

Starting Right with Turkeys.—By *G. T. Klein*, Extension Poultry Husbandman, Massachusetts State College, Author Back Yard Poultry Keeping. Edited by *Ed. Robinson*, Author of The "Have More" Plan, 129 pages; 90 illustrations. Published by the Macmillan Company, Chicago 16, Ill. Price $2.50.

This work is designed for those who would raise from a few to a hundred turkeys. It does not deal with the problems of commercial turkey raisers. The whole subject is treated from the egg to table—the selection of the breed, incubation, brooding, growing, slaughtering, dressing, freezing and cooking; with directions for constructing brooders, shelters, sunporches, feeders, waterers, etc. Feeding and rations and care come in for attention.

Five-hundred million turkey dinners are produced in this country annually, mainly by commercial turkey growers. The author thinks that is not enough; a great number of family size flocks of a dozen birds, more or less, should be raised, for the dinner table or for sale or both.

Much stress is placed upon the necessity for sanitary measures to avoid disease, disappointment and loss.

Any book reviewed in these pages, or any other book if available, may be obtained by remitting the published price to VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago 49. Bulletins and Circulars should be requested direct from the address given in the notice. Generally they are supplied free unless a price is stated.

Bulletins, Circulars, Reports, Etc.

Controlling Poultry Diseases.—Extension Bul. 312 (revised 1946). Purdue University Agr. Ext. Service, Lafayette, Ind.

Rabies.—Rabies a challenge to the community. Will be supplied in quantity to veterinarians on request. Lederle Laboratories, New York 20, N. Y.

Report, Livestock Sanitary Board.—Thirty-ninth and fortieth annual reports of the North Dakota Livestock Sanitary Board. State Veterinarian, Bismarck, N. D.

Milk House Plans.—Working blue prints and material requirements. Approved by the Missouri State Board of Health. Folder No. D1721, Ralston-Purina Co., St. Louis, Mo.

Fowl Paralysis — Leucemia. — The etiology of fowl paralysis leucemia and allied conditions. Tech. Bul. 422, Univ. of Florida Agr. Exp. Sta., Gainesville.

Brucella Suis Infection of Cattle. — Transmission of *Brucella suis* from swine to cattle under pasture conditions. Research Bul. 398. University of Missouri Agr. Exp. Sta., Columbia.

Diseases of Sheep.—Section II of a report on disease of farm livestock, 101 pages, issued by the National Veterinary Medical Association of Great Britain and Ireland, 36 Gordon Square, London, W. C. 1, England. Price not stated.

Rabies.—Rabies, plain facts that help you understand this disease of man and animals. A popular discussion; illustrated. Contains no advertising. On request it will be supplied in quantity to veterinarians for distribution to their clients. Jensen-Salsbury Laboratories, Kansas City, Mo.

Dressed Poultry Inspection Regulations.—Rules and regulations of the Secretary of Agriculture governing the inspection and certification of dressed poultry and dressed domestic rabbits and edible products for condition and wholesomeness. Service and Regulatory Announcement No. 131, Production and Marketing Administration USDA, Washington 25, D. C.